Updated 2017

Montana Noxious Weed Management Plan

OFFICE OF THE GOVERNOR
STATE OF MONTANA

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Dear Friends,

This 2017 plan update outlines current weed programs for responsible parties across Montana, highlights strengths of current programs and identifies needs for those programs. The plan also identifies "Action Items" that provide necessary actions to move Montana closer to accomplishing the ten goals set forth in the plan.

Non-native species are altering ecosystems, reducing cropland and rangeland productivity, impacting wildlife habitat and threatening survival of native species.

The purpose of the Montana Weed Management Plan is to strengthen, support and coordinate private, county, state, and federal weed management efforts in the state, and promote implementation of ecologically based integrated weed management programs.

Please join me in supporting efforts to reduce weed populations and their spread in Montana. Management of noxious weeds is everyone's responsibility. This serious threat to our native landscapes and ecosystems will be stopped only if we work together.

Thank you for your support of the Montana Weed Management Plan.

Sincerely,

STEVE BULLOCK
Governor

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Executive Summary

Rangeland, pastureland, cropland, forests, and wildlands comprise 92 million acres, or 98% of the total land area in Montana. These lands are vital for agricultural production and protecting the integrity of ecological systems. Non-native plant species are affecting the economic stability of the state and impacting the ecological integrity of Montana's lands and waters.

The purpose of the Montana Noxious Weed Management Plan is to strengthen, support, and coordinate private, county, state, and federal weed management efforts in the state, and promote implementation of ecologically-based integrated weed management programs. The plan mirrors the 2016 Montana Invasive Species Framework and is organized into five focal areas: Coordination, Prevention, Detection, Rapid Response, and Control. The following statewide goals are addressed in each corresponding chapter and in the task list found in Appendix A.

Coordination

- Expand long term funding sources for private, county, state and federal land managers to implement a comprehensive weed management program that includes all aspects of integrated weed management.
- Utilize current prevention and Early Detection and Rapid Response strategies to reduce the introduction and establishment of noxious weeds.
- Support statewide noxious weed coordination.

Prevention

- Increase public education and awareness about environmental impacts and management of noxious weeds.
- Promote and support noxious weed research based on needs determined by land managers.
- Research and develop a current noxious weed economic impact assessment.

Detection

- Expand the use of EDDMapS West database system by land managers for noxious weed inventories on all lands in Montana.

Rapid Response

- Develop strategies for noxious weed related emergencies that occur from natural disasters.

Control

- Strengthen and expand cooperative weed management areas that include private, municipal, university, county, state, tribal and federal land interests.
- Prioritize and implement ecologically based integrated weed management programs.

Financial resources are inadequate to effectively manage all noxious weeds in Montana. Increased funding to private land managers, county weed districts, federal, and state agencies, and improved efficiency and organization of grassroots efforts are critical to implementing weed management programs in the state.

This plan is a dynamic document designed for weed managers in Montana including state, federal, county, and private stakeholders. It requires involvement of Montana citizens, and local, regional and national stakeholders to meet objectives and implement the plan.

Foreword

Noxious weeds pose a major threat to Montana's economy and environment. During the past century, weeds have expanded to infest over 8.2 million acres, or 9% of the state, degrading the productivity and biological diversity of ecosystems. Infested acres were provided by county weed districts and do not include all private lands. An action plan involving private, county, state, and federal entities is critical to stop the introduction of new weed species and reduce the spread of established infestations.

The Montana Department of Agriculture acknowledges reference to the following for development of the Montana Noxious Weed Management Plan 2017 update.

- 2016 Montana Invasive Species Framework
- 2008 Montana Weed Management Plan
- 1998 Governor's Montana Weed Summit
- 1995 Vision 2020 Work Group

Information was also provided by the Bureau of Indian Affairs, Federal Land Management Agencies, Montana Noxious Weed Education Campaign, Montana State University, Montana Weed Control Association, Montana Weed Coordinator Support Committee, State Land Management Agencies, Tribal Natural Resources, University of Montana and other members of Montana's weed community. For further references, refer to Appendix H.

The Montana Noxious Weed Management Plan provides the conceptual framework and recommendations for preventing the introduction and for managing the spread of noxious weeds in Montana. The plan provides guidance and direction on a statewide level while maintaining flexibility for local priorities and actions. It is designed to complement regional, national, and international strategies in the National Invasive Species Management Plan.

Organization of the Plan

The plan provides an outline of programs and requirements to more effectively meet short and long-term management objectives rather than describing management criteria for individual weed species. The Montana Noxious Weed Management Plan was updated to reflect the five components identified in the 2016 Montana Invasive Species Framework. Each chapter begins with objectives identified in the Framework, followed by statewide goals that address the gaps and actions needed to successfully manage noxious weeds in Montana. Programs and organizations that are working towards completing those objectives and goals are described in each corresponding chapter. Specific program details and funding information was provided by each agency and organizations listed throughout the plan.

Chapter 1 – Introduction

This chapter describes the impacts associated with noxious weeds in Montana and what is needed to have effective weed management.

Chapter 2 – Coordination

This chapter identifies agencies and organizations that have the leadership to strengthen Montana's weed management efforts.

Chapter 3 – Prevention

This chapter describes how agencies and organizations are working to prevent the introduction and spread of noxious weeds into healthy Montana ecosystems.

Chapter 4 – Detection

This chapter describes programs used to search, detect, and monitor noxious weed populations in Montana.

Chapter 5 – Rapid Response

This chapter identifies collaborative efforts that work towards preventing and eradicating new invader populations in Montana.

Chapter 6 – Control

This chapter describes how an integrated weed management approach is used by weed management programs to reduce the negative impact of noxious weeds across Montana.

Chapter 7 – Weed Management Programs

This chapter describes existing programs and capabilities of state, local government, private, federal, and research land managers.

Chapter 1 – Introduction

Noxious weeds are a major threat to Montana's natural resources, outdoor recreation, wildlife habitat, and the state's agricultural economy. Montana needs a comprehensive weed management plan because noxious weeds impact all Montana citizens.

The first weed legislation in Montana was passed in 1895, and a noxious weed program was established in 1921. Since that time additional laws and rules have been enacted to strengthen weed management efforts. The eight laws as of 2017 affecting weed management in Montana are described in detail in Appendix E.

Statewide goals, specific objectives and programs increase awareness and foster coordination, cooperative weed management efforts across Montana.

Noxious Weed Impacts

A weed is defined as any plant that interferes with management objectives for a given area at a given point in time. Noxious weeds are defined as "plants of foreign origin that can directly or indirectly injure agriculture, navigation, fish or wildlife, or public health" (Montana Weed Control Act, 2015). Although there are native and intentionally introduced non-native plants that have invasive characteristics, this plan will focus on Montana state-listed noxious weeds in Appendix D.

Noxious weeds are reducing the economic productivity and ecological integrity of Montana's lands and waters. The rate of introduction and spread of noxious weeds has increased dramatically over the past 100 years with increases in human activities and commerce. For example, spotted knapweed was first recorded in Montana in the early 1920's. Since that time it has spread to every county in the state. The introduction and spread of spotted knapweed is characteristic of several noxious weeds in Montana (Figure 1.1).

Due to the vastness of Montana and its weed issues, it is critical that we utilize a variety of management methods that are both fiscally and environmentally responsible and effective.

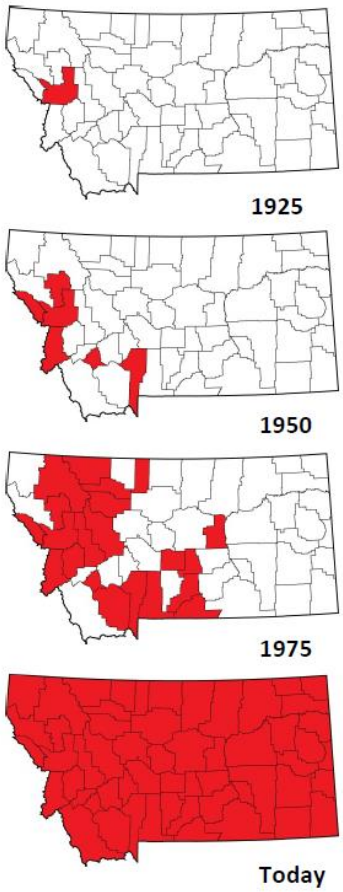


Figure 1.1: Montana counties reporting infestations of spotted knapweed from 1925 to present (Invaders Database).

Economic Impacts

Bioeconomic models were used to evaluate annual economic impact of spotted knapweed and leafy spurge on grazing land and wildland values in Montana. Annual direct impacts of spotted knapweed to grazing land value in Montana include lower personal income and lost cash outlays from reduced livestock production. Annual direct impacts to wildland values, include reduced wildlife associated recreation and reduced soil and water conservation.

Economic losses for ranchers from reduction in livestock forage due to spotted knapweed and leafy spurge populations were measured across Montana. It was estimated that the average reduction in biomass resulting from the reported presence of spotted knapweed and leafy spurge was at 0.7 to 0.8%. Funds are spent to control noxious weeds to avoid the loss in grazing land. The estimated total economic loss including both the costs of control and the costs of foregone production was found to be $1.29 per acre per year. These numbers would be higher if other noxious weeds species were incorporated into the study (Fuller et al., 2016).

Ecological Impacts

The ecological impacts caused by noxious weeds in Montana are numerous; the following information describes some of these effects. Water quality and long-term production potential of land can be reduced when tap-rooted species such as spotted and diffuse knapweed invade grasslands. In western Montana, surface runoff was 56% higher and sediment yield was 192% higher on spotted knapweed infested sites compared to those dominated by native bunchgrass (Lacey et al., 1989).

Noxious weeds can also alter hydrologic cycles, sediment deposition, erosion, and other ecosystem processes causing serious

ecological damage. Saltcedar in Montana impacts wetland and riparian areas by lowering water tables and changing soil properties. This reduces or eliminates surface water habitats required by native plants and animals. Saltcedar infestations also trap more sediment than stands of native vegetation, thus altering the shape, carrying capacity, and flooding cycle of water courses (McDaniel et al., 2005).

Noxious weeds are recognized as serious problems on lands managed for wilderness or wildland values by federal, state, and private entities in Montana. When weeds invade and expand into a wilderness environment, the "naturalness" of the area is degraded and scientific values of once biologically diverse landscapes are impaired. Examples include leafy spurge infestations at Pine Butte Swamp Preserve and the remote Danaher Creek area of the Bob Marshall Wilderness, and spotted knapweed invasions in most wilderness areas and national parks in Montana.

Wildlife Impacts

The introduction of noxious weeds influences wildlife by displacing forage species, modifying habitat structure, such as changing grassland to a forb-dominated community, or changing species interactions within the ecosystem. Leafy spurge reduces habitat utilization by bison, deer, and elk (Trammell and Butler, 1995). Spotted knapweed was shown to influence elk and deer foraging behavior and population distribution in western Montana. Elk use increased an average of 266% after knapweed was removed from a winter range site (Thompson, 1996).

Noxious weeds also impact small birds and mammals. Grasshopper sparrow and savannah sparrow densities were lower on high (>60%) leafy spurge cover than on medium (20 to 60%) or low (0 to 20%) cover (Scheiman et al., 2003). Purple loosestrife, a weed that infests wetlands, was first reported in Montana in 1980 and by 2004 infested 10 counties in the state. Loosestrife forms dense infestations that reduce desirable plants, such as cattails, that are preferred habitats for muskrats and long-billed marsh wrens. Waterfowl broods are also more susceptible to predation because dense stands of purple loosestrife reduce access from water to nesting sites (Brown, 2005). Changes in bird species have been reported on sites dominated by non-native weed species such as leafy spurge. Russian knapweed has been shown to reduce small mammal populations (mice) by altering species diversity (Kurz, 1995).

Although significant progress has been made in weed management, inadequate financial and labor resources are available to effectively manage noxious weeds in Montana. Increased funding to private land managers, county weed districts, federal, and state agencies, and improving efficiency and organization of grassroots efforts are needed to move Montana forward in effective weed management.

Chapter 2 – Coordination

MISAC Framework Objectives:

- Respond to invasive species as a shared responsibility and a common priority across the state by integrating and strengthening Montana's management program.
- Engage in and support regional efforts to manage invasive species at the local, watershed, and regional levels to allow effective resource sharing, staff expertise, and perimeter defense.
- Build sustainable funding for a statewide, invasive species program with common priorities while recognizing the authorities and resources of diverse partners.

Statewide Plan Goals:

- Expand long term funding sources for private, county, state, and federal land managers to implement a comprehensive weed management program that includes all aspects of integrated weed management.
- Utilize current prevention and early detection and rapid response strategies to reduce the introduction and establishment of noxious weeds.
- Support statewide noxious weed coordination.

The management of noxious weeds, and protection and restoration of habitats are critical issues. The lack of a comprehensive weed management program will lead to continued habitat degradation and displacement of native biodiversity. Management actions must be based upon principles and practices consistent with current sciences, prevention, detection and rapid response, control methods, targeted grazing and restoration to meet noxious weed management objectives.

Leadership at the county, state, and federal level is critical for directing noxious weed programs, implementing state weed laws, and allocating limited resources. The level of coordination and cooperation between these agencies determines how successful weed management programs will be in Montana. The implementation of this plan will be better facilitated by improved coordination and cooperation between the different levels of government, university researchers, and private land managers.

County Weed Districts (CWDs)

The 56 CWDs in Montana provide an important role in organization, implementation, and oversight of local noxious weed management programs. CWDs are also responsible for implementing the Montana County Weed Control Act. Counties coordinate with state and federal agencies on public lands. County weed coordinators are a primary contact for private land managers. The county weed coordinator usually takes on the leadership role of creating Cooperative Weed Management Areas and is usually the lead person applying for a Noxious Weed Trust Fund grant.

Montana Department of Agriculture (MDA)

MDA is the primary state agency providing statewide leadership and coordination for noxious weed management. The number and diversity of national, regional, and state noxious weed issues necessitates the need for leadership at the state level. The department has three strong noxious weed programs: the State Noxious Weed Coordination program, Noxious Weed Trust Fund grant program and the Noxious Weed Seed Free Forage program. These programs are led by the Statewide Noxious Weed Coordinator position which is critical as the Department of Agriculture is the lead entity conducting and directing local, state, regional, and national weed management efforts in our goal of implementing the Montana Weed Management Plan. These programs also help with the state's noxious weed problem by providing funding for on-the-ground projects, education, research projects, and preventing the spread of noxious weeds in forage.

State and Federal Natural Resource and Land Management Agencies

State and federal land management agencies control 34% of land in Montana. Therefore, every county in Montana has either state or federal land or both within their county boundary. The US Forest Service, Bureau of Land Management, US Department of Agriculture, USDA Natural Resource Conservation Service, Montana Department of Transportation, Department of Fish, Wildlife & Parks, and Department of Natural Resources and Conservation are key agencies to work with for their support and involvement in weed management programs and projects. The leadership of these agencies is critical to successful weed management across the state.

Chapter 3 – Prevention

MISAC Framework Objectives:

- Reduce the transport of invasive species into and within Montana by fully engaging existing entities and resources.
- Develop a shared, statewide set of priority invasive species to exclude from Montana based on their threat to economic, environmental, or cultural values.
- Increase involvement in preventing the spread of invasive species by engaging new audiences, motivating those who can interact with invasive species pathways, and supporting existing stewards.

Statewide Plan Goals:

- Increase public education and awareness about environmental impacts and management of noxious weeds.
- Promote and support noxious weed research based on needs determined by land managers.
- Research and develop a current noxious weed economic impact assessment.

The majority of weed management programs in Montana focus on land that is dominated by noxious weeds. An equal, if not greater effort should be made to prevent their spread into lands that remain non-infested. Preventing weed invasion is the most ecologically sound and economical land management strategy and the first line of defense. This includes the ability to predict which noxious weed species are likely to enter the state and implement education, regulation, inspection, and/or quarantine programs to prevent entry of those invasive plants.

A comprehensive, systematic approach for preventing the introduction and spread of noxious weeds into healthy Montana ecosystems is critical to the success of this plan. The protection of healthy ecosystems from noxious weed introduction and spread should be made on a site-specific basis to maximize efforts and resources. A successful prevention program includes the ability to:

1) Prioritize healthy ecosystems and predict which noxious weeds will invade these areas.
2) Engage and educate landowners to manage and protect weed-free areas from invasion.
3) Survey and inventory the pathways and spread vectors of noxious weeds.
4) Promote and implement proper ecosystem management to encourage desirable plant communities.
5) Increase awareness of the benefits of using noxious weed seed free forage on private lands and making aware the lands that require certified forage.

Land managers are encouraged to use the Invasive Plant Prevention Guidelines, developed by the Montana Prevention Task Force, to prevent the invasion and permanent establishment of noxious weeds on roadsides and in natural areas.

The Prevention Guidelines are available to download free from www.msuextension.org. The guide is divided into four sections: land, water, animals, and fire.

The guide was developed with the firm conviction that healthy, non-infested ecosystems can be protected from noxious weeds by implementing practical, proactive, weed prevention actions. Elements of the prevention document include:

- Limiting the introduction of noxious weed seeds into an area.
- Early detection and eradication of small patches of weeds.
- Minimizing disturbance of desirable vegetation along roadsides, trails, and waterways.
- Managing land to build and maintain healthy communities of native and desirable plants to compete with weeds.
- Careful monitoring of high-risk areas such as human and animal transportation corridors and disturbed or bare ground.
- Revegetating disturbed sites with desirable plants.
- Evaluating annually the effectiveness of the prevention plan.

Education

Education, outreach, and awareness efforts are essential components of the Montana Noxious Weed Management Plan not only to further the general publics' understanding about noxious weeds, but to also provide a call to action on what individuals can do to help stop the spread of noxious weeds. By providing education and outreach about the detrimental effects noxious weeds have on ecological processes, the environment, the economy, and recreational activities to Montana residents, landowners and visitors, individuals will be encouraged to take action and participate in prevention efforts.

Montana has a long history of providing noxious weed awareness and education programs to its citizens. There is still a need to elevate the 'what can I do to help' level of comprehension among Montanans by highlighting activities they can participate in to not only prevent the spread of noxious weeds, but also to help contain and eradicate existing infestations. Educational outreach and awareness efforts are centered on the ability to provide land managers with the latest information about current systems-based integrated weed management (IWM) methods. Strategies used to meet these objectives are based on continued research and an understanding of the dynamic needs, apprehensions and behaviors of Montana residents and visitors.

Montana is not only faced with reaching various population types with innovative technologies, we are challenged to continuously cycle existing education programs through traditional media. The need to communicate with varied audiences is joined by challenges to secure funding to create information materials for newly invading and establishing plant species. Inconsistent program funding for maintaining existing programs sets the stage for inadequate resources to generate materials about risks, impacts, prevention, and management of these species.

With the implementation of the Montana Weed Management Plan in 2000, many Cooperative Weed Management Areas, watershed groups and citizen action groups increased participant numbers and diversity of stakeholders, all of whom were involved in implementing the plan. Due to the lack of consistent and stable government funding, several groups have formed grassroots community based fundraisers to assist with noxious weed control; functions such as the Big Hole Weed Whackers Ball, the Blackfoot Challenge and Madison Valley Ranchlands are all examples of citizen based noxious weed educational efforts.

Montana Weed Control Association (MWCA)

The MWCA is a state non-profit organization committed to strengthening and supporting noxious weed management in Montana. This group includes professional weed managers, weed control businesses, ranchers/farmers, educators, researchers, students, and government officials from city, county, state and federal levels. Their focuses include:

1) Networking to encourage collaboration, participation, and sharing of knowledge and expertise.
2) Providing a non-biased and balanced collection, sharing and dissemination of knowledge to the membership and the public.
3) Ascertaining research priorities from the members, communicating priorities and needs to the research community, assisting in the funding process, and relaying research results back to the membership.

Montana Noxious Weed Education Campaign (MNWEC)

In 1998, the Statewide Noxious Weed Awareness and Education Campaign (SNWAEC) Task Force pulled together stakeholders and launched a strategic mass media awareness campaign in Montana that echoed the national 'Pulling Together Against Noxious Weeds' campaign. In 2012 the SNWAEC reorganized, redefined its goals and mission statement, and became the MNWEC; which now focuses on educating the people of Montana about the economic and environmental impacts of noxious weeds while encouraging the public to participate in ecologically based IWM.

Collaborative partnerships and grassroots efforts at the county level have contributed to the success of the Campaign by providing county weed coordinators, state, federal and tribal land managers the materials they need to meet their area-specific educational goals. The Campaign has achieved success in strengthening a concise, cohesive statewide noxious weed educational campaign.

The MNWEC in cooperation with stakeholders, agencies and other non-governmental organizations will continue to develop educational guidelines and training programs for various targeted audiences such as small-acreage landowners, real estate professionals and developers, utilities and transportation companies, recreationalists, sportsmen, tourists, conservation groups, residents on reservations, government employees, youth, and youth educators.

The MNWEC continues to promote national invasive species campaigns while creating several unique statewide programs. Some of those campaigns and programs include:

- Montana Noxious Weed Realtor Training
- Multi-media outreach
- K-9 classroom packet materials
- Play Clean Go Campaign
- Adopt-A-Trailhead Montana

Montana State University Extension Services (MSU Extension)

MSU Extension continues to provide education on various weed management methods to agricultural producers, owners of small acreages, conservation districts, county weed districts, federal agencies, private contractors, and industry. Training programs are targeted toward weed district employees, agricultural producers, herbicide applicators, private landowners, as well as county, state, and federal land managers. Information included in education efforts

includes: mapping and monitoring, inventory, Early Detection and Rapid Response, weed and plant identification, ecologically-based IWM methods, herbicide mode of action and fate in the environment, and current research regarding weed management techniques. MSU Extension continues to partner with other weed education and awareness entities like MNWEC and MWCA to further common goals.

Scientific Research

Research provides a scientific foundation for effective, sustainable, ecologically-based weed management. More effective management strategies must be developed to protect Montana's natural resources from invasive noxious weeds. The Weed Research Task Force formed in 1999 identified six general research areas critical for invasive weed management in Montana. Research priorities, objectives, and funding were reviewed and revised in 2004 by a coalition of individuals representing the Center for Invasive Plant Management, Montana State University, University of Montana, MWCA Research Needs Committee, federal agencies, and private industry.

The two-way transfer of knowledge between researchers and land managers is critical for incorporating new scientific knowledge into management strategies. Increased collaboration and adequate funding would allow Montana's scientific community to make significant advances in knowledge about invasive plant species leading to opportunities for improved management.

The six research areas identified are: impacts, prevention, weed biology and plant dynamics, IWM, land reclamation, and effects of natural disturbance.

Impacts

- Quantify the effects of weeds on Montana's economy (considering crops, livestock, wildlife, tourism, and recreational revenues).
- Develop new methods and test current methods to screen the invasion potential of new plant species introduced as crops or ornamentals, and species established in adjacent states but not yet detected in Montana.
- Quantify current and potential pathways of invasion through inventory, survey, and monitoring of current established and potential invasive species.
- Determine the relationship between environment and variability in species invasion potential to prioritize environments for Early Detection and Rapid Response.
- Quantify current and potential effects of noxious weeds on Montana's ecosystems, including biodiversity change, nutrient cycling and hydrologic cycling.
- Quantify the effects of noxious weed management strategies on ecosystems. Develop effective monitoring techniques for land managers and land owners.

Prevention

- Identify invasion routes, favorable habitats, environmental and plant traits correlated with invasiveness of noxious weed species. Develop models predicting invasion.
- Develop and implement site-specific "best management practices" to prevent invasion through identified routes.
- Develop the scientific basis for management techniques to prevent weed invasion or re-invasion.

Noxious Weed Biology and Plant Dynamics

- Identify factors controlling plant community dynamics. Collect plant community information to identify key processes in the life cycle of invasive species. Identify important environmental relationships that may favor or discourage invasion and provide for effective management. Absence data can be as important as presence data.
- Document weed population response on range & pasture, crop rotations, minimum or no-till, and irrigated agriculture due to climate change.
- Investigate the compatibility of noxious weeds with potential biocontrol agents, the potential for herbicide resistance, and differences in the ecology and spread of weed populations.

Integrated Weed Management

- Develop IWM strategies that increase healthy plant community types. Conduct workshops on incorporating experimentation into land management practices.
- Enhance and support consortia involved in biological control as they identify new target weeds and associated natural enemies. Improve propagation, distribution, collection, and monitoring of agents.
- Evaluate critical interactions among biological control agents and environmental conditions that may affect efficacy, and evaluate long-term effects on ecosystems.
- Improve the effectiveness and use of herbicides by investigating response and persistence of desirable vegetation as well as the target weed(s).
- Enhance the use of targeted grazing for weed management. Develop multi-species grazing systems that decrease weeds, and increase diversity and abundance of desired plant species.
- Develop and improve strategies for agricultural weed management, including crop rotations, prevention of herbicide resistance, and application of site-specific weed management technology.

Land Reclamation

- Develop and demonstrate methods for revegetating and reclaiming disturbed land.
- Develop improved understanding about the interactions between soils, plants (invasive, desired), and other key site properties that govern the potential methods and outcomes of restoration efforts.

Effects of Natural Disturbance

- Determine effects of natural disturbance (fire, flood, drought, etc.) on weed biology, ecology, and spread.
- Determine optimal post-disturbance management for weed-infested areas. Develop management guidelines to minimize weed spread.

Chapter 4 – Detection

MISAC Framework Objectives:

- Identify invasive species and responsibly share the locations of high priority invasive species across jurisdictions in Montana to focus and improve management.
- Increase and improve search efforts for invasive species with an emphasis on newly establishing invasive species to contain their populations to a smaller area.
- Improve monitoring for invasive species populations and control efforts to ensure that management is measured, analyzed, and evaluated for effectiveness.

Statewide Plan Goals:

- Expand the use of EDDMapS West database system by land managers for noxious weed inventories on all lands in Montana.

Prioritizing Weeds

Detecting new noxious weed invasions begins with proper identification and knowing the differences between native and invasive species. Noxious weeds in Montana are divided into five priorities based on the status of the invasive plant in the state.

The statewide noxious weed list is updated as needed and is adopted by administrative rule under the provisions of the Montana County Weed Control Act. Changes or additions are based on advice and recommendations from the Noxious Weed List Workgroup. The workgroup reviews petitions for additions to the list using established criteria, and then makes recommendations to the Director of Montana Department of Agriculture for final approval. The Montana State Noxious Weed list can be found in Appendix D.

Priority 1A (Non-established new invaders)

These noxious weeds are not present or have a very limited presence in Montana. The management criteria requires eradication if detected, education, and prevention. Proper protocol for managing these species includes the following:

1) Become familiar with the state's noxious weed list and weed identification.
2) Contact the statewide weed coordinator at the Department of Agriculture.
3) Contact the appropriate task force coordinator.
4) Accurately map or log GPS coordinates of the weed's location.

Priority 1B (Established new invaders)

These are noxious weeds that have a limited presence in Montana. Management criteria requires eradication, containment and continued education. The infestation size of priority IB weeds is relatively small and the management methods used for these noxious weeds include mechanical and chemical control.

Priority 2A and Priority 2B (Widespread weed infestations)

These are noxious weeds that the local county weed districts prioritize for management based on the abundance of a weed within a specific area, and land management goals and objectives. These

noxious weeds have several integrated weed management tools for land managers to control and contain these invasive plants. There are biological control agents that work well on several noxious weeds in this group. Targeted grazing works well on large infestations of Leafy spurge, Spotted knapweed, and Dalmatian toadflax. Herbicides continue to be a widely used tool to control this group of noxious weeds for land managers.

Priority 3 (Regulated plants)

These are invasive weeds that have the potential to have significant negative impacts to the state. These invasive plants cannot be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education, and prevention to minimize the spread of these regulated plants.

Mapping

"Comprehensive, range-wide maps of the distribution (presence and absence) and relative abundance of invasive weeds, regularly updated over time, provide valuable data for delivering effective management with limited resources. Understanding the spatial proximity and relative magnitude of noxious weeds in a geographic area enables managers to conduct accurate weed risk assessments, develop specific control strategies, prioritize monitoring and outreach efforts, and establish baselines for long-term conservation of habitats.

Data sharing and integration frameworks can minimize these problems of inconsistency in data collection and reporting and accessibility to data, as well as address gaps in our knowledge of invasive plant distributions" (Goodwin, 2015).

The Montana Department of Agriculture encourages all land managers to use the Early Detection and Distribution Mapping System (EDDMapS) for mapping noxious weeds when conducting surveys and inventories. EDDMapS was developed in 2005 by the Center for Invasive Species and Ecosystem Health at the University of Georgia as a way to map and keep track of invasive species infestations. The web-based system was designed to fulfill three basic needs: simplify the reporting process, alert managers to new reports, and generate distribution maps for the reported species. EDDMapS was designed to work across agency, organization, and disciplinary boundaries to offer a real-time picture of invasive species distribution across the country.

EDDMapS continues to grow along with new technology and has been expanded to cover all of the US and Canada. In 2010, several states, including Montana, pooled their resources to launch a new version of EDDMapS customized for the western US, spearheaded by the Missouri River Watershed Coalition and Center of Invasive Species Management at Montana State University. The resulting production, EDDMapS West, focuses on species that are new or potentially new invaders to the western states. EDDMapS West was designed with multiple user groups in mind, including local, state, and federal agencies, private landowners, educational institutions, outreach groups, and concerned citizens. A user guide for EDDMapS West is available from the Montana Department of Agriculture website.

Chapter 5 – Rapid Response

MISAC Framework Objectives:

- Develop a generalized rapid response plan for emerging invasive species.
- Develop the capacity to respond to new invasions of high priority invasive species to contain their spread, limiting the damage they cause.
- Prepare natural resource managers to effectively use all tools available to improve the outcomes of rapid response actions.

Statewide Plan Goals:

- Develop strategies for noxious weed related emergencies that occur from natural disasters.

The state has specific task force groups for high priority noxious weeds, such as rush skeletonweed, tansy ragwort, yellow starthistle, and Dyer's woad. Each task force is responsible for implementing Early Detection and Rapid Response tactics to contain and control any reported infestations. Each task force has a coordinator to assist in the collaboration of efforts across the state and areas of infestation. As of 2017, the following weeds have a task force group:

- Dyer's Woad (1A)
- Rush Skeletonweed (1B)
- Purple Loosestrife (1B)
- Blueweed (1B)
- Hawkweeds (2A)
- Tansy Ragwort (2A)
- Tall Buttercup (2A)
- Saltcedar (2B)

Contact MDA for additional information.

USDA Animal and Plant Health Inspection Service and Plant Protection and Quarantine (APHIS/PPQ)

The Department of Homeland Security, Customs and Border Protection (CBP) inspect commodities entering the country. They follow USDA, APHIS and PPQ regulations to prevent the introduction of federally listed noxious weeds.

APHIS issues weed and biological control permits, and evaluates petitions for proposed biological control agents. APHIS Early Detection and Rapid Response efforts focus on evaluating the need for regulation on newly found infestations or for plants not yet known to occur in the US; designing and funding surveys, control activities, data design, and management; and public education. These efforts are usually done in cooperation with other federal and state agencies.

PPQ's mission is to safeguard U.S. agriculture and natural resources against the entry, establishment, and spread of economically and environmentally significant pests, and facilitate the safe trade of agricultural products.

PPQ works closely with CBP to enforce authorities covered by the Plant Protection Act of 2000, in an effort to prevent the introduction of invasive plants. Should an invasive species pass the first line of defense (the ports), PPQ focuses on Early Detection and Rapid Response in cooperation with many local, state, and federal public and private cooperators.

PPQ plays an active role in initiating, coordinating, and facilitating the distribution of weed biological control agents. Recent Montana biological control projects with PPQ involvement include: spotted and diffuse knapweeds, leafy spurge, purple loosestrife, saltcedar, Dalmatian toadflax and field bindweed. PPQ coordinates these efforts through the Montana Biological Control Working Group.

Chapter 6 – Control

MISAC Framework Objectives:

- Grow both capacity and expertise in managing invasive species in Montana to improve program effectiveness.
- Expand collaborative working relationships with enforcement agencies to increase compliance with existing regulations for invasive species.
- Ensure that invasive species control restores the desired ecological, economic, and cultural values to the land that is being managed.

Statewide Plan Goals:

- Strengthen and expand cooperative weed management areas that include private municipal, university, county, state, tribal, and federal land interests.
- Prioritize and implement ecologically based integrated weed management programs.

"Invasive noxious weeds are difficult to manage and therefore likely to spread to new sites. Successful management requires an integrative approach that combines public support and policy, interagency and landowner cooperation, and multiple control strategies" (Goodwin, 2015).

Biological Control

One reason exotic invasive species can gain a competitive advantage in their new environment is due to the absence of the naturally occurring arthropods and pathogens which may impact a plant, either by reducing its vigor or occasionally killing it. These organisms may be found where weed plants originate abroad. Biological weed control involves the intentional manipulation of these living organisms to reduce weed infestations.

Biological control is just one of many tools available in an integrated weed strategy. Its implementation is largely decided by the target weed, infestation levels, habitat and climatic variables, and the degree of control desired. Biocontrol is more applicable to large landscapes or where weed suppression is limited by economic factors.

Biological weed control is not new to Montana. The practice dates back to 1948 with the release of *Chrysolina* beetles on St. Johnswort. However, it was not until the mid-1970s that greater resources and personnel were available for biocontrol of several weed species including spotted knapweed. In the late 1980s and through the 1990s there was a major expansion of biological control activities as agents became available for spotted, diffuse, and Russian knapweeds, leafy spurge, Dalmatian and yellow toadflax, musk thistle, as well as several other weeds. During this time there was an increase of personnel working on biological control at the county, university and federal levels, and the construction of two containment facilities for the study and importation of new agents. Various school groups became active in rearing and redistributing biocontrol agents. Montana now has a highly engaged biological control program comprising of various cooperating groups such as federal agencies, universities, county weed districts, state land management agencies, local schools, foreign research scientists, tribal land managers, and private individuals or companies.

In 2008, the Montana Weed Control Association initiated the Montana Biocontrol Coordination Working Group (MBCWG) to bring together the diversity of biocontrol participants and to strengthen Montana's leadership in biological weed control. This working group was charged with:

1) Developing a structure to assist in and improve the current methods of redistribution and monitoring of biological control agents.
2) Identifying deficiencies in the current implementation of weed biological control in Montana.
3) Offering recommendations to improve biological control as a weed management tool.

The MBCWG's mission focuses on using biocontrol to:

- Limit the spread of existing invasive weed species.
- Abate the negative ecological and economic impacts of invasive weed species.
- Improve and support invasive weed management.

In 2015 the working group drafted The Montana Action Plan for Biological Control of Invasive Plants. The objectives of this action plan formulate a planning strategy for future biological control efforts in Montana that facilitates continued cooperation. The plan identifies four focal areas which are the cornerstones of biological control programs: coordination, research and development, implementation, and outreach and technology transfer. As part of this action plan, specific objectives and action items were identified for each of these four focal areas.

Coordination
- Identify stakeholders and participants.
- Improve and continue communications.
- Identify biological control priorities and funding.
- Coordinate activities within Montana.

Research and Development
- Prioritize projects and target weeds.
- Identify biological control priorities.
- Rear agents and develop insectaries.
- Study impacts (ecological, non-target, etc.).
- Integrate biological control with existing weed management strategies.
- Survey and screen new agents.

Implementation
- Collect and redistribute biocontrol agents.
- Monitoring biocontrol agents and sites and integrate biocontrol with other weed management strategies.

Outreach and Technology Transfer
- Organizing field days and demonstration plots.
- Establishing and distributing biocontrol educational materials, websites, media exposure, etc.

In 2013, private, city, county, state, and federal partners came together to fund a statewide biological control coordinator. The coordinator provides leadership, coordination, and education that enables land managers to successfully incorporate biological weed control as part of their noxious weed management program. Through this program the number of training and informational workshops continues to increase reaching larger numbers of attendees. The number of counties and landowners participating in the redistribution of biological agents has been greatly enhanced since 2013. The Montana Biocontrol Coordination Project website provides general biological weed control information, specifics about the effective

biocontrol agents currently utilized in Montana, a calendar including dates of biocontrol collections and workshops being held throughout the state, and printable resources for obtaining and utilizing biocontrol agents.

Montana's tansy ragwort project is an example of how biological control successfully contributes to an IWM approach. Large infestations of this weed were discovered after wildfires in 1994 and encompassed diverse land ownership and differing management goals. A long term management program was implemented with a combination of techniques, such as surveys, chemical control, containment, biological control, and continued monitoring. Tansy ragwort populations have decreased dramatically because of these integrated efforts, and biological control should continue to provide long-term, cost-effective control against this weed.

Restoration, Reclamation, and Revegetation

These are terms that can often be confused, and for the purpose of this document are defined as follows:

- Restoration is a return of something to an original or unimpaired condition.
- Reclamation is reclaiming degraded lands to productive or desired use. Reclamation attempts to restore some elements of structure and function in an ecosystem. It is considered less ambitious but sometimes more feasible than restoration.
- Revegetation is to cause desirable vegetation to grow again.

Soil or ecological site-adapted desired plants should be restored onto a site where invader species are to be eradicated. Restoration planning to reoccupy the site with desired vegetation should be an integral component of a weed management program when loss or displacement of desirable species has occurred. Without restoration of desired plants, the area is likely to become re-infested with either the same or a new weed species. Disturbed areas, where protection and restoration projects may protect critical habitat or important natural features, should have the highest priority. Areas where restoration has a good chance of success should also be a high priority.

In some cases, revegetation may not be necessary to restore a desired plant community. For example, if a moderately healthy component of the desired vegetation remains on the site, restoration may be achieved through other weed management techniques such as multi-species grazing, herbicide applications, and/or the integration of techniques applied in a manner that addresses how plant communities change naturally. Before revegetation occurs, sites should be evaluated for the presence and composition of desired species to determine if revegetation is necessary. The need for revegetation should be determined before weed treatments occur so that seeding can be done soon after the weeds have been removed and before the treated species or other weed species recolonize the site. Monitoring is required to determine which native species establish well and whether a second seeding is desirable.

Although efforts to restore appropriate desired plant communities are being used on disturbed sites, such as rights-of-ways, mining areas, and power and transmission lines, there is limited work of this kind being done on degraded range, pasture, and woodland sites. Range, pasture, and woodland sites are home to a majority of the noxious weed infestations in the state. Land mangers across Montana are encouraged to increase restoration efforts on these lands.

Chapter 7 – Weed Management Programs

Montana encompasses approximately 94 million acres consisting of approximately 28% federal, 6% state, 5% tribal, and 61% private land ownership. Rangeland, pastureland, cropland, forests, national parks, nature preserves, and other wildlands comprise 98% or approximately 92 million acres of the total land area of the state (USDA NRCS, 2012). These lands are vital for agricultural production and protecting the integrity of ecological systems.

Montana's weed program is divided into four cooperative working groups: state, local government, private, and federal.

Effective management of noxious weeds depends upon several underlying capabilities:

1) Strong local, state, and federal leadership.
2) Establishment of priorities based upon a science-based assessment of risks.
3) Ready access to current scientific and management information.
4) Strong noxious weed laws and regulations.
5) Coordination and cooperation between agencies, across levels of government, and the public and private sectors.
6) Development of stable funding to sustain current programs and initiate new projects.
7) Elevated public awareness, empowerment to implement IWM strategies, and support of weed management efforts.

Information in this chapter was provided by each agency or organization in 2017. If nothing was reported, figures remain based on the 2008 Plan.

State

State management agencies develop long-term management plans and allocate funding within each county where they manage lands.

Lands administered by state agencies encompass approximately 5.8 million acres. State agencies in Montana are required to develop a management plan to address noxious weed issues on state managed land. Although plans are completed, not all lands have budgets dedicated to the management of weeds. The County Noxious Weed Control Act requires agencies owning land in Montana to submit a summarized weed management report to the Department of Agriculture biennially.

Montana Department of Agriculture (MDA)

MDA's state weed program includes statewide noxious weed oversite, operational aspects of the Noxious Weed Trust Fund (NWTF) grant program, and activities of the Noxious Weed Seed Free Forage program (NWSFF). In addition to the noxious weed programs, other Agricultural Sciences Division employees lend expertise and assistance to the weed management effort in Montana. These specialist positions include the following services: worker protection and certification, soils and ground water, quarantine and nursery, feed, seed, and regional pesticide training.

MDA is the primary state agency providing leadership for noxious weed management. The number and diversity of national, regional, and state noxious weed issues necessitates the need for leadership and organization at the state level. The state

noxious weed coordinator works with federal, state, county, and private entities to ensure coordination and oversight of weed management programs at the state and national level.

Noxious Weed Trust Fund
The NWTF program was established in 1985 and is administered through MDA. The grant program provides cost share funding to assist citizens, counties, local communities, researchers, and educators in their efforts to solve a variety of weed problems in Montana. NWTF grant awards assist landowners within Cooperative Weed Management Areas by providing 50% of approved project costs that are matched by landowners. Approximately 200 grants and pass through funding allocations are awarded by the NWTF for approximately $2.2 million annually. Weed management programs funded by the NWTF must focus on state or county-listed noxious weeds.

Members of the NWTF's advisory council are appointed by the director of MDA and provide funding recommendations to the Department. The advisory council is made up of 10 voting members plus the chair, and 12 nonvoting members.

Noxious Weed Seed Free Forage
The 1995 Legislature passed the Noxious Weed Seed Free Forage Act because they realized the natural resources of the state need to be protected from noxious weeds and their seeds. As a result of the Forage Act, certified forage is required when horses, mules or pack animals are used on public lands in Montana. Government agencies and public utilities are also required to use weed seed free mulches, bedding materials, and erosion control barriers. All seeds and wattles used for reclamation purposes must also be free of noxious weed seeds.

The forage program's advisory council is appointed by the director of MDA and provides advice to the department on the administration of the program. The advisory council is made up of 10 voting members and two ex-officio, nonvoting members.

Forage producers interested in participating in the forage program contact a certified field inspector, which are local county extension agents or weed coordinators that have been certified by MDA. The producer's field is inspected for noxious weed seeds and a fee is assessed by the field inspector. Producers are required to use approved markers, which include: special orange and blue twine, or a red tag on each bale of certified forage, or an orange adhesive label on bagged certified forage.

Montana Department of Corrections

Montana Department of Corrections manages a 37,720 acre ranch in Montana. Noxious weeds (predominantly spotted knapweed and leafy spurge) infest approximately 3,000 acres with approximately 50% of the area inventoried. They use an integrated program including prevention, release of biological control agents, livestock management, aerial and ground herbicide applications to manage noxious weeds on the ranch. An integrated management plan was completed in 2000.

Montana Fish, Wildlife & Parks **(FWP)**

FWP manages more than 615 sites across the state and is responsible for weed management on approximately 522,000 acres, both in the form of fee title and leased lands. Managed sites include administrative offices, state parks, hatcheries, wildlife management areas, and fishing access sites. Aquatic weeds are managed under the direction of the FWP and the Department of Natural Resources and Conservation.

Based on 2015 reports, the number of weed-infested acres on FWP owned and/or managed land was estimated at 39,500 acres. Detailed information on infested sites is on file with MDA and FWP. Consistent with FWP's weed management plan, FWP employs an integrated noxious weed management approach that emphasizes early detection and treatment of new starts, chemical treatment of areas with a high likelihood of weed dispersal such as parking lots and roads, chemical and biocontrol on extensive infestations, and cooperative coordinated management with neighboring properties.

Integrated weed management activities occur on approximately 6,000 to 9,000 acres annually (not including biological control). Funds are also used for education and outreach and other vegetation management activities like improved grazing management, plantings, irrigation, and mechanical treatments.

Weed treatments are achieved through a combination of agency staff, private contracted services, and county weed districts. Funding is derived through multiple operations budgets of the Fisheries, Wildlife and Parks Divisions. The 2017 budget for weed control is $460,000.

Montana Department of Natural Resources and Conservation (DNRC)

State Water Projects

The State Water Projects Bureau owns approximately 19,000 acres in the state. This includes 18 water storage projects including the necessary canals associated with dams and reservoirs. Each water storage project is managed by a water users association under contract with State Water Projects to take care of the daily operations, maintenance, repairs and necessary alterations. In return, the State markets water for agricultural purposes to these associations.

Due to legislation passed in 2003, the State Water Projects Land Management/Weed Control Coordinator position was eliminated and weed management responsibilities were assigned to the Environmental Science Specialist. Unfortunately only 5 to 10% of this person's time can be spent on weed management related activities. These activities are limited in scope and effort. Activities typically include annual letter reminders to associations to maintain weed control efforts, spot inspections at selected projects and follow up coordination with the respective associations, responding to public complaints, and identification of problem areas requiring additional oversight.

This limited approach appears to be working at water storage projects. Except for projects with recreational leases (FWP fishing access sites or state parks) all costs associated with the operations of the projects are the responsibility of the water users association, including weed control. Essentially, this is a small part of the sale price of the State's water.

For those project lands under grazing, agricultural, or cabin site leases, weed control is an underlying requirement in the lease. Annual spot inspections are conducted to verify compliance.

Trust Land Management Division (State School Trust Lands)

Trust Land Management Division (TLMD) manages State School Trust Lands (SSTL) on 5.2 million surface and 6.2 million subsurface acres across all 56 counties in Montana. The goal of TLMD is to manage Montana's Trust Land resources to produce the greatest revenue for the trust beneficiaries pursuant to 77-1-202 MCA, while considering environmental factors and protecting the long-term income-generating

capacity of the land. TLMD is under direction of the Board of Land Commissioners (State Land Board) consisting of the Governor, Attorney General, Secretary of State, Auditor, and Superintendent of Public Instruction.

DNRC has six Area Offices (AO) and 15 Unit Offices (UO) across the state. The TLMD is divided into four primary programs: Agriculture and Grazing Management Bureau (AGMB), Forest Management Bureau (FMB), Minerals Management Bureau (MMB), and Real Estate Management Bureau (REMB). Staff and program specialists in Helena and Missoula provide program administration, direction, oversight, and support to field personnel. Field personnel throughout the state provide on-the-ground management.

The AGMB has a dedicated annual noxious weed management budget of $80,000 for projects on leased, licensed, and vacant SSTL. The AGMB also contributes approximately $20,000 of funding on an annual basis towards noxious weed control projects from the Recreational Use Program. The FMB contributes approximately $150,000 annually for noxious weed management projects in conjunction with timber management.

Total acres infested by noxious weeds are unknown at this time and statewide inventories have not been conducted on SSTL. Based on 9% of lands infested in Montana, a total of 624,000 acres are infested on SSTL.

The TLMD has developed six area noxious weed management plans in conjunction with the six AO to guide noxious weed management for SSTL across all 56 counties in accordance with the responsibilities established in 7-22-2151 MCA Cooperative Agreements (CA). These CAs are evaluated and renewed every six years. The goals of these plans are to:

1) Identify noxious weed infestations on state lands.
2) Monitor priority noxious weed infestations and weed management compliance.
3) Identify AO/UO weed management projects warranting involvement by the Department.
4) Consolidate TLMD weed management projects and develop budget proposals for executive and legislative consideration.

The CAs are broken down into individual County Weed Management Plans to coordinate efforts between CWDs and AO/UO in the pursuit of noxious weed management control and/or eradication on SSTL within the county. County Weed Management Plans are updated on a biennial basis and lay out specific plans for the biennium including a budget to implement the plan.

On classified agricultural and grazing land through lease or license, the state's surface lessee(s) are responsible for noxious weed control per the lease agreement. Noxious weed control on vacant classified agricultural and grazing lands is the responsibility of the TLMD. On classified forest lands, noxious weed control is done in conjunction with timber management and is the responsibility of the timber sale buyer, logger, and DNRC.

Montana Sage Grouse Habitat Conservation Program

The greater sage grouse was once a candidate for listing under the federal Endangered Species Act. In September, 2015, the U.S. Fish and Wildlife Service (USFWS) determined that protections were not warranted, in part because Montana had adopted a statewide conservation strategy.

The USFWS identified invasive species and noxious weeds as important threats to the sagebrush habitats which sage grouse rely upon for nearly everything and throughout the year. Exotic annual grasses and other invasive / noxious plant species alter habitat suitability for sage grouse by reducing or eliminating native forbs and grasses essential for food and cover. Non-native annual grasses also facilitate an increase in mean fire frequency.

Montana's Sage Grouse Conservation Strategy is based on the collaborative work of the Montana Sage Grouse Habitat Conservation Advisory Council and supported by diverse stakeholders. The 2015 Legislature passed the Greater Sage Grouse Stewardship Act and Governor Bullock signed Executive Orders 12-2015 and 21-2015.

Montana's goal is to conserve greater sage grouse and key sagebrush habitats so that Montana will maintain authority to manage its own lands, wildlife, and economy. Implementing Montana's Conservation Strategy will ensure that listing under the federal Endangered Species Act will never be warranted.

The Sage Grouse Habitat Conservation Program (Program) was created to facilitate implementation of Montana's Conservation Strategy and the Executive Orders across state government, by federal land management agencies, and private entities seeking to develop projects in key sage grouse habitats. The Program is overseen by the Montana Sage Grouse Oversight Team. The Program is administratively hosted by the Montana Department of Natural Resources and Conservation.

Executive Order 12-2015 sets forth guidance to avoid and minimize disturbance and impacts that would promote the spread of invasive plant species in sage grouse habitats. Treatment and removal of native sagebrush is strongly discouraged to maintain healthy range conditions with robust perennial native grass, forb, and shrub cover. Consistent with state laws and county efforts, Executive Order 12-2015 requires weed management for all new activities in designated sage grouse habitats. Reclamation of disturbed areas must also include control of noxious weeds and invasive plant species, including cheatgrass (*Bromus tectorum*). Provisions for post-wildlife site rehabilitation and habitat restoration efforts are also included.

Montana Department of Transportation (MDT)

Highway/roadway rights-of-ways are a high-risk area for introduction of new weeds to the state and can serve as a key avenue for movement of weeds into non-infested sites. MDT manages interstate, national and primary highways, and secondary highways. Acreage encompassed by rights-of-ways is estimated at 159,000 acres. Road construction activities such as widening and straightening existing highways, as well as assuming the responsibility for maintenance of paved secondary roads, add approximately 800 to 1,000 acres of new rights-of-way responsibilities per year.

Contractors are mandated to contact county weed districts for reclamation requirements on roadside projects and monitor reclamation projects on a regular basis. MDT's weed control budgets for rights-of-ways are continually evaluated and adjusted as needed.

Construction Sites and Reclamation of Disturbed Rights-of-Ways

- MDT must allow county weed boards to review and comment on the reclamation specifications for all road construction

projects that disturb ground off of the driving surface.

- Some counties require approval of borrowed sources prior to any material placement within rights-of-ways, as well as power-washing of all equipment brought into construction project areas.
- The Standard Specifications for Road and Bridge Construction - 2014 Edition provided strong direction to construction contractors to abide by the County Weed Management Act. Standard Specifications 107.11.5 – 107.11.6 refer to Noxious Weed Management. They instruct all bidders to "Determine the specific noxious weed control requirements not specified in the Construction Contract of each county where the project is located before submitting a bid."
- For each project that results in ground disturbance, a Noxious Weed Control Special provision is inserted in the contract. The special provision requires the contractor to monitor and treat noxious weeds within the perimeter of the project area until the project is completed and the contract is closed. A payable bid item is included in these contracts to reimburse contractors for the expense of weed control.

Universities

University of Montana (UM) manages 129 and 483 acres at Fort Missoula and Mount Sentinel respectively. In addition to these lands UM also has 28,000 acres at Lubrecht Experiment Station, and 3,400 acres at Bandy Ranch. 2017 weed management budgets for Fort Missoula and Mount Sentinel include a part-time coordinator supplies, and travel, with additional grants for weed research.

Montana State University (MSU) has seven Montana Agricultural Experiment Stations (MAES) Research Centers (Sidney, Huntley, Moccasin, Havre, Creston, Corvallis, and Conrad) encompassing 7,085 acres. These stations are utilized for noxious weed research and also manage invasive weeds as part of maintenance/operating budgets. In addition to Research Centers, the MSU College of Agriculture manages the MAES Bozeman Area Research and Teaching Farm (600 acres), Post Research Farm (250 acres) Fort Ellis Research Farm (700 acres), and Red Bluff Research Ranch (12,662 acres) plus 635 acres of state and federal leases as teaching and research facilities. Weed research and management is funded and accomplished by MAES and COA employees. Annual weed management budgets are increasingly tight due to reduced spending power (i.e., flat or decreasing budgets).

Local Government

A number of local government agencies manage lands in Montana including county road departments, city street departments, airports, city and county parks, cemeteries, sewer and water districts, fairgrounds, historical museums, irrigation districts, and schools. In addition, several of Montana's larger cities have programs to help purchase land for the purpose of preserving open space lands.

County Weed District Programs (CWDs)

The 56 CWDs in Montana are the cornerstone of Montana's weed program. Weed districts establish management criteria for noxious weeds on all lands within the district (7-22-2109, MCA) and implement and enforce the Montana County Weed Control Act. In addition, CWDs conduct weed education and awareness programs, develop cooperative agreements and Cooperative Weed Management Areas,

manage noxious weeds on county-owned/controlled lands, coordinate weed management activities within and among counties, and monitor weed infestations on private and public lands.

The county weed district is responsible for developing a district-wide noxious weed management plan to assist county residents in complying with the Montana County Weed Control Act. The plan establishes management criteria for noxious weeds and describes weed district responsibility for management of noxious weeds on all land and rights-of-ways owned or controlled by the county or municipalities within the district. Management criteria includes the integration of cultural, chemical, mechanical, and biological methods for controlling noxious weeds.

Budget information for CWDs in Montana are generated annually from mill levies, general fund, or other county-tax revenue. Budgets are discussed in detail in Appendix B. Some counties are capable of supporting a full-time weed control position based on county-tax revenue alone. In an effort to support part- or full-time weed management positions, counties rely on revenue generated from contract weed control work. Funding levels in most counties are inadequate to meet 2017 needs.

Montana Association of Conservation Districts (MACD)

MACD is a locally lead private non-profit. There are 58 conservation districts in Montana. Their approach is largely non-regulatory and addresses general natural resource issues. MACD helps conserve natural resources by helping local people match their needs with technical and financial resources.

County Extension

Montana State University Extension is a statewide educational outreach network that applies unbiased, research-based university resources to practical needs identified by the people of Montana. County extension offices are located throughout the state's 56 counties and seven reservations.

Private

Private land managers work cooperatively with CWDs and other agencies to manage weeds on private lands.

Private Land Owners

Private lands encompass approximately 61% or 57,340,000 acres (USDA NRCS, 2012). Weed inventory information is not available for most private lands in Montana. Based on the average infestation of 9% on lands in the state, approximately 5 million acres of private land is infested. The average cost for on-the-ground weed management in Cooperative Weed Management Areas is $47 per acre (calculated from 2015-2016 NWTF local cooperative grants). Alternative funding sources for managing noxious weeds on private land is required to maintain adequate control.

The Montana County Weed Control Act states that private land managers must develop and follow a weed management plan on their land. However, the magnitude of the weed problem, jurisdictional conflicts, cost of weed management, relatively low net return per acre of range and pastureland, and lack of cost-share funds has made it difficult for private landowners to effectively manage weeds. Although several counties offer cost-share programs for specific weed species, there are inadequate financial resources to assist private landowners with weed management.

The NWTF and other grant programs through federal agencies, private foundations, and sportsman organizations provide limited funding for weed control on private lands. Cooperative Extension Service and CWDs coordinate local public education programs and provide technical assistance and training to private land managers on noxious weed management issues. The NRCS, Farm Service Agency (FSA), and Soil and Water Conservation Districts (SWCD) provide technical and some internal program-based financial assistance to landowners.

Montana Fish, Wildlife & Parks' Block Management Program provides annual incentive payments to private landowners specifically for weed management. Funds are intended to offset potential weed spread caused by public hunting access on private property.

Cooperative Weed Management Areas (CWMAs) are the foundation for effective weed management involving private and public lands in Montana. Since 1985, cost-share programs have provided incentive for development and implementation of CWMAs in Montana. More information on establishing a CWMA can be found in Appendix F.

Private Conservation Organizations

The Nature Conservancy (TNC) is one of the largest conservation organizations in Montana. In addition to protecting lands through conservation easements (about 250,000 acres), TNC owns and manages 92,000 acres, about half of it in preserves. Their largest holding is the Matador Ranch in southern Phillips County.

Management of invasive non-native plants is a priority on TNC lands and includes partnerships with other private, state, and federal landholders within seven community-based programs. TNC is an integral part of several large cooperative weed management efforts including the Weed Prevention Area surrounding the Matador Ranch, the Blackfoot Challenge CWMA in the Blackfoot Valley, the Red Rock and Big Hole Watershed CWMA in southwestern Montana, and the Weed Roundtable of the Rocky Mountain Front. TNC provides labor, materials, and funding to implement integrated management of noxious weeds on their lands and on adjoining CWMAs.

The Montana Association of Land Trusts reported that private landowners, public agencies and land trusts have conserved about 2.5 million acres of agriculture ground, wildlife habitat and open land, which also protects clean water, riparian areas and shorelines. Montana is a nationally recognized leader in both the quality and quantity of private land conservation.

Rocky Mountain Elk Foundation (RMEF) has a mission to ensure the future of elk, other wildlife and their habitat. In support of this mission, the RMEF is committed to managing noxious weeds to conserve, restore, and enhance natural habitats. The RMEF provides funding toward cooperative vegetation management projects involving public and/or private lands. These projects utilize IWM including burning, reseeding, fencing, livestock manipulation, release of biological agents, and the use of herbicides.

National Fish and Wildlife Foundation (NFWF) was established by Congress in 1984, and is a private, non-profit, organization dedicated to the conservation of fish, wildlife, plants, and the habitat on which they depend. The NFWF in partnership with other federal agencies provides funding to non-profit organizations and government agencies interested in

managing invasive and noxious plant species.

USDA Natural Resources Conservation Service (NRCS) does not directly manage lands in Montana, but it provides millions of dollars to Montana landowners annually for conservation. The conservation efforts include controlling noxious weeds in pastures, rangelands and croplands, and revegetating weed infested lands with desirable species. In addition, NRCS develops and collaborates on noxious weed educational materials, technical guides, and research. These education materials are distributed through trainings, workshops and the website to make them accessible to all Montanans.

Private Industry

Private industry includes local vendors for herbicides, biological agents (livestock, insects, and pathogens), seed suppliers, plant nurseries, herbicide applicators, inventory and monitoring specialists, and natural resource consultants. Private industry serves as an important link between local individuals and agencies for providing technical assistance, developing and coordinating cooperative weed management projects, and other expertise that supports and promotes weed management in Montana.

Railroads are a vector for the introduction and establishment of noxious weeds and their subsequent spread from railroad lands to adjoining private, state, and federal lands. Controlling the establishment and spread of weeds on these rights-of-ways is critical for managing weed populations in Montana and protecting non-infested sites. Burlington Northern Santa Fe (BNSF), Montana Rail Link (MRL), and Union Pacific (UP) are the principle railroads in the state. UP contracts with Beaverhead and Butte/Silver Bow Counties for management of noxious weeds on 113 miles of track. Funding is inadequate to control all weeds on UP rights-of-ways in these counties. Private contractors are utilized for noxious weed control on MRL and BNSF rights-of-ways. In 2004, the Western Area Weed Council and MRL initiated development of an integrated vegetation management plan for MRL railroad rights-of-ways. Funding was allocated to MRL rights-of-ways in six western Montana counties. Burlington Northern Santa Fe has 2,168 miles of track in Montana. Based on a rights-of-way width of 200 feet, total acres encompassed by BNSF rights-of-ways is 52,466 acres.

Utility Rights-of-Ways for power, communications, and other public services are a major avenue for weed introduction and spread. Most easements are on private land and weed control responsibility is negotiated between the utility company and private landowner. Utility companies are required by law (7-22-2152, MCA) to send a copy of the reclamation and weed management plan to the CWD for any new construction or reconstruction of existing services with major land disturbance. Once projects are completed, responsibility of weed management reverts to the landowner and contract agreement with the utility company.

Open Pit Mining
The Montana County Weed Control Act (7-22-2152, MCA) states that any state agency or local government unit approving a mine or other major disturbance shall notify the board and submit a written plan specifying revegetation at least 15 days prior to the activity. Several counties have written policies regarding removal and purchase of gravel, topsoil, rock, sand, and other materials. The County Weed Control Board is responsible for inspection and approval under county policy. In general, once projects are completed, the responsibility of

weed management reverts to the landowner or contract obligation between the landowner and the excavating company.

Large Corporate Land Owners

Large corporate landowners are an important component of the Montana Noxious Weed Management Plan. Budgets for noxious weed management are included with other program costs and are allocated and spent on a case-by-case basis. The analysis for financial resources necessary to adequately address weed issues has not been completed. Costs for these acres were included in figures for private land managers.

Federal

Cooperation of federal land managers is an integral component of the Montana Weed Plan. Lands administered by federal agencies comprise 27 million acres or about 28% of the total land area in Montana. USDA Forest Service and United States Department of Interior Bureau of Land Management manage the majority of these acres. Current 2017 status of lands administered by federal agencies is described below.

USDA Forest Service (FS)

The Northern Region of the FS manages approximately 17.1 million acres in Montana, distributed across eight national forests and 40 ranger districts. Based on 2016 weed inventory information, an estimated 624,000 acres or 4% is infested with invasive weeds, although not all FS lands in the state have been surveyed for the presence of weeds.

Weed management on FS lands is guided by a national strategic framework for invasive species management (USDA Forest Service 2013). Treatment accomplishments are tracked in an agency database (TESP-IS) and the FS annually treats about 36,000 acres of invasive weed infestations on national forest lands in Montana. Funding for this management is provided by several FS resource programs. Partnerships with CWDs, CWMAs, tribes and other cooperators are also very important in accomplishing treatments on national forest lands.

Early Detection and Rapid Response is a top priority. Rush skeletonweed and tansy ragwort infestations are being targeted on the Bitterroot, Flathead and Kootenai National Forests.

In addition to weed management, other invasive plant program activities, such as prevention, education and awareness, restoration, and database management, are all part of the invasive species program in the Northern Region. The region has been a funding partner to the Montana Noxious Weed Education Campaign.

The USDA Forest Service has two other agency branches that also support the invasive species program:

1) State and Private Forestry (S&PF) provides technical support associated with pesticide training, aerial applications and a liaison with state pesticide regulatory entities. S&PF provides grants to MDA for awards through the NWTF. S&PF also provides training and technical assistance to a number of federal, state, tribal, and private partners in Montana, with emphasis on weed biological control and integrated pest management strategies relating to invasive plants.
2) Rocky Mountain Research Station (RMRS) continues an active invasive species research program dedicated to understanding the causes and consequences of plant and animal

invasions and improving invasive species management. Focal areas include biological control, herbicide use, restoration ecology, and quantifying invader impacts on plants and animals. RMRS also maintains an Invasive Species Working Group dedicated to collecting and transferring research results to managers.

USDI Bureau of Indian Affairs (BIA)

The BIA is divided into twelve regions nationally covering about 54 million acres. The Rocky Mountain Region includes Indian trust lands (both tribal and individually owned) in Montana and Wyoming. In Montana, seven reservations comprise approximately 5.3 million acres of Indian trust lands, with an estimated 13% or 722,456 acres of trust land infested by noxious weeds. Funding for weed management projects through BIA is dedicated only to Indian trust lands. Noxious weed management activities or efforts completed by BIA are conducted as additional duties within other disciplines. However, the Rocky Mountain Regional Office of BIA continues to compete nationally for funding of local noxious weed management projects.

Noxious weed management at various reservations varies greatly depending on interest, commitment, and local priorities. Many reservation weed management projects are conducted in conjunction with adjoining counties.

Acres of Indian trust land shown below do not include fee (deeded) lands within the boundaries of the reservations.

Blackfeet Reservation includes 962,000 acres of Indian trust land. Approximately 80,000 acres are infested with noxious weeds.

Crow Reservation includes 1.5 million acres of Indian trust lands. Approximately 126,500 acres are infested with noxious weeds.

Flathead Reservation includes more than 700,000 acres of Indian trust lands of which about 200,000 acres are infested with noxious weeds.

Fort Belknap Reservation includes 617,000 acres of Indian trust land. Noxious weeds infest about 6,700 acres.

Fort Peck Reservation includes 913,000 acres of Indian trust land with approximately 3,280 acres infested with noxious weeds.

Northern Cheyenne Reservation includes 442,000 acres of Indian trust land with about 9,200 acres infested with noxious weeds.

Rocky Boy's Reservation includes 111,000 acres of Indian trust lands with about 1,800 acres infested with noxious weeds.

USDI Bureau of Land Management (BLM)

The BLM manages about eight million surface acres in Montana, comprised of nine field offices and two national monuments. Approximately 14% or 1,095,000 acres are infested with invasive plants. The BLM has been implementing the National Integrated Weed Management Plan, Partners Against Weeds (PAW) since 1996. This management plan has action goals that support the Montana Noxious Weed Management Plan including:

- Prevention and Detection
- Education and Awareness
- Inventory
- Planning
- Integrated Weed Management
- Coordination
- Monitoring

- Evaluation
- Research
- Technology Transfer

Through the implementation of the PAW plan, all resource management programs participate in IWM.

As of August 2016, the BLM completed programmatic Environmental Impact Statements (EISs) for Vegetation Treatments Using Herbicides. The Records of Decision have authorized the use of 24 different herbicides for control and management of invasive plants on BLM administered lands. The BLM has established assistance agreements in Montana for cooperative management of invasive plants on public lands. The BLM continues to support biological control research with USDA Agricultural Research Service (ARS), Montana State University, University of Montana, and the University of Idaho.

The 2017 budget for weed management in Montana is approximately $1.1 million. Due to the scattered land pattern of BLM administered lands, cooperative efforts with other entities are a vital part of the BLM's IWM program.

USDI Bureau of Reclamation (Reclamation)

Reclamation manages approximately 200,000 acres of land in Montana, whereas reservoirs comprise another 110,000 water surface acres. These areas are managed through two regional offices, two area offices, and five field offices. Reclamation has 13 reservoir project areas east of the continental divide and Hungry Horse Reservoir west of the divide. Reclamation directly manages lands surrounding five reservoirs. Other Reclamation lands are administered by other agencies, including the FS, USDI National Park Service, BLM, USDI Fish and Wildlife Service, FWP, and by irrigation districts. As of this writing, funding for weed control totals $125,000. Weed control coordination efforts are not funded separately from other land management activities. It is estimated that an annual budget of $270,000 would be needed to support a full-time coordinator, continue control agreement and contracts, update and conduct inventories, and reduce current 2017 weed infestations by 5% annually.

USDI Fish and Wildlife Service (FWS)

As the federal agency with primary responsibility for conservation of fish, wildlife, and their habitats, the FWS has a critical leadership role in the invasive species crisis. Confronting invasive species presents a major challenge in the management of the National Wildlife Refuge System (NWRS). In Montana, the FWS manages over 1.3 million acres; 23 National Wildlife Refuges (NWR), five Wetland Management Districts (WMD) that include Waterfowl Production Areas and conservation easements, and over 64,000 acres designated as wilderness. NWR across the state range in size from Lee Metcalf NWR at 2,792 acres to over 1 million acres at the Charles M. Russell NWR.

The FWS estimates approximately 37,000 acres of NWRS lands in Montana are infested with invasive plant species (2007 Refuge Annual Performance Plan). However, much of the NWRS does not have resources to conduct invasive plant inventories so acreage estimates could be conservative. The NWR and WMD struggle to treat perimeters of infestations and travel corridors for containment, which leaves few resources to conduct inventories.

The Montana Invasive Species Strike Team (Strike Team) assists the NWR and WMD

staff in managing invasive species on NWRS land at $450,000 annually. The focus is on invasive plant control, but they also play an important role in prevention, inventory, monitoring, restoration, and creating community partnerships.

The control of invasive plants is a priority for the NWRS and they have leveraged limited funds into larger projects. Examples include partnerships with the U.S. Army Corp of Engineers on Ft. Peck Reservoir and with the Charles M. Russell NWR for tamarisk control.

Along with management efforts on federal lands, the FWS Partners for Fish and Wildlife program assists private landowners in enhancing habitat and developing invasive plant management plans. FWS also provides volunteers to assist in invasive plant management on NWRS lands. FWS helps fund and support the development of education tools and media outreach projects that help fight noxious weed invasions.

Funding within FWS for invasive species inventory and treatment limits the amount of work that can be accomplished on NWRS lands in Montana. An estimated 7% of infested acres are treated annually with available resources.

USDI National Park Service (NPS)

Nez Perce National Historic Park—Big Hole National Battlefield encompasses 656 acres in Montana. Approximately 50 acres are infested by noxious weeds mostly along trail and road corridors.

Nez Perce National Historic Park—Bearpaw Battlefield encompasses 190 acres in Montana with an estimated 10 acres infested with noxious weeds mainly along trails and road corridors.

Bighorn Canyon National Recreation Area encompasses 68,491 acres with 41,095 acres in Montana. Approximately 200 acres are infested with noxious weeds in Montana.

Glacier National Park encompasses 1,013,572 acres in the Hudson Bay and West Lake districts. An estimated 4,283 gross acres are infested with state-listed noxious weeds. The Exotic Vegetation Management Plan (1993) is currently being updated with action plans written and revised annually. Annually, 150 acres are treated manually and/or chemically and approximately 3,000 gross acres are surveyed.

Grant-Kohrs Ranch National Historic Site encompasses a 1,600 acre cultural landscape with 195 acres infested with noxious weeds.

Little Bighorn Battlefield National Monument encompasses 765 acres with 100 acres infested with noxious weeds.

Fort Union Trading Post National Historic Site encompasses 460 total acres with 112 acres in Montana. Noxious weeds infest approximately 40 acres in the Montana portion of the park. The Northern Great Plains Exotic Plant Management Plan and Environmental Assessment was completed in September of 2005 which included Fort Union Trading Post National Historic Site.

Yellowstone National Park (YNP) encompasses 2.2 million acres, including 3% or approximately 66,653 acres of the park in Montana. The park continues to operate on a Draft Exotic Vegetation Management Plan, which was updated in 2006. In 2007, the park program focused on education, prevention, participation in six CWMA partnerships, treatment of 12 new invaders, and containment of 16 established species. Park wide, staff annually survey 3,000 acres of high probability areas including roads and developed areas. In

addition, in 2007 a park wide backcountry survey was conducted of approximately 600 miles of trails and 282 campsites or approximately 94% of the sites. Only five "priority 2" species were documented at 21 sites, with no new invaders found. Most high priority species have been contained to the roadsides and developed areas; however, there are widespread infestations of Dalmatian toadflax and Canada thistle on an estimated 1,000 acres occurring in the Montana portion of the park. Projected park-wide budget estimates include objectives to contain and manage existing infestations, prevent new invasions, increase public awareness, and stop newly invading species and improve infrastructure, research, and equipment.

Appendix A: Tasks for Implementing the Montana Noxious Weed State Plan

This appendix was created by using objectives from the 2016 Montana Invasive Species Framework and goals from the 2008 Montana Noxious Weed Management Plan. The list of tasks for each objective and goal was provided by the agencies and groups listed under responsibility. This is a fluid document and is designed to be updated as needed.

Coordination

1) **Respond to invasive species as a shared responsibility and a common priority across the state by integrating and strengthening Montana's management program.**
Responsibility: MDT, CWD, and Agencies
   - Continue to develop and expand county partnerships.
   - Build and/or expand partnerships with federal, state, city, tribal, and private entities.
   - Include weed coordinator or weed board members on the subdivision committee of the County Planning Board.
   - Improve coordination between SWCDs, MDA, and weed districts to facilitate funding weed management projects at the local level.

2) **Engage in and support regional efforts to manage invasive species at the local, watershed, and regional levels to allow effective resource sharing, staff expertise, and perimeter defense.**
Responsibility: MDA, CWDs, DNRC State Water Projects, MBCWG, Private Conservation, MNWEC, and BLM
   - Implement a statewide biocontrol monitoring protocol.
   - Promote, develop, and facilitate CWMAs on lands covered by conservation easements with other private landholders, and county, state, and federal agencies.
   - Continue to develop county partnerships.

3) **Build sustainable funding for a statewide, invasive species program with common priorities while recognizing the authorities and resources of diverse partners.**
Responsibility: MDA**,** MWCA, DNRC, MDT, FWP and CWDs
   - Seek alternative sources of funding for weed related impacts from non-sportsman outdoor recreationists that have not traditionally been targeted.
   - Pursue federal, state, and other granting opportunities.

4) **Expand long term funding sources for private, county, state, and federal land managers to implement a comprehensive weed management program that includes all aspects of IWM.**
Responsibility: MDA, CWDs, Private, BIA, Reclamation, FWS, and Universities
   - Increase funding within the NWTF to allow for additional weed management grants on private lands.
   - Develop long-term, stable, adequate funding for CWDs that support employment of full-time, professional, qualified individuals to serve as CWD coordinators. If necessary, consider consolidating multiple counties to ensure a full-time position.

- Develop cost-share incentives and promote IWM projects on private lands. Identify and secure funding sources to support cost-share programs on private lands.
- Work with Congress and land management agencies at state and national levels to increase federal cost-share for noxious weed management.
- Increase county weed budgets and dedicate a portion of those funds toward cost-share programs.
- Enhance funding for granting opportunities for cooperative invasive plant projects on NWRs lands and adjoining lands.
- Identify and secure funding sources to support IWM projects on university – and Agricultural Experiment Station – owned lands.
- Increase the annual budget for noxious weed control on Indian reservations in Montana to adequately address weed management issues on Indian trust lands.
- Increase Reclamation's annual budget to support a full-time coordinator, continue weed management agreements, and reduce weed infestations by 5%.

5) Utilize current Prevention and Early Detection and Rapid Response strategies to reduce the introduction and establishment of noxious weeds.

Responsibility: MBCWG, BIA, and Reclamation

- Conduct periodic surveys of CWDs and public land agencies to determine priority weeds that should be targeted for biological weed control.
- Develop Weed Management Plans in conjunction with tribes for each Indian reservation.
- Develop and implement a statewide weed management plan for Reclamation lands.

6) Support statewide noxious weed coordination.

Responsibility: MDA, FWP, MDT, MBCWG, Private Industry, FS, BIA, MNWEC, and Reclamation

- Continue to provide agency-wide weed coordination through a fulltime FTE.
- Coordinate with biological weed control interests from other states, Canada and Europe to share knowledge and to establish priorities.
- Support the formation of consortia as a way to develop funding partnerships.
- Improve coordination and communication between private industry and local, state, and federal entities on weed management issues; and facilitate technology transfer, public education, and development of CWMAs.
- Increase coordination with other agencies and partners to address statewide vegetation concerns and management.
- Restore staffing on national forests that have reduced capacity in the invasive species program, and reestablish a full-time program coordinator position at the regional level.
- Establish a Noxious Weed Coordinator position within BIA.
- Support a full-time weed coordinator position for Reclamation.

Prevention

1) **Reduce the transport of invasive species into and within Montana by fully engaging existing entities and resources.**
   Responsibility: CWDs
   - Update and expand county weed management plans annually to complement Montana's State Weed Management Plan.

2) **Develop a shared, statewide set of priority invasive species to exclude from Montana based on their threat to economic, environmental, or cultural values.**

3) **Increase involvement in preventing the spread of invasive species to exclude from Montana based on their threat to economic, environmental, or cultural values.**
   Responsibility: FWP, BLM, and NPS
   - Continue to promote healthy rangeland and riparian management to reduce susceptibility of lands to weed establishment and spread.
   - Conduct public education and awareness campaigns, contribute to research.
   - Increase the budget for NPS lands in Montana for monitoring, research, and management of noxious weeds on NPS lands.

4) **Increase public education and awareness about environmental impacts and management of noxious weeds.**
   Responsibility: MBCWG, CWDs, and MNWEC
   - Provide educational programs on biological weed control.
   - Enhance public education program at the county level that empowers individuals to implement IWM strategies.

5) **Promote and support noxious weed research based on needs determined by land managers.**
   Responsibility: MBCWG, FS, and CWDs
   - Assist the research community in establishing a list of priority invasive plants to be targeted.
   - Encourage and support Forest Service Research programs on invasive plants and animals.

6) **Research and develop a current noxious weed economic impact assessment.**

Detection

1) **Identify invasive species and responsibly share the locations of high priority invasive species across jurisdictions in Montana to focus and improve management.**
   Responsibility: DNRC State Water Projects, FWP, and MDT
   - Support Montana's Aquatic Nuisance Species (ANS) Management Plan/Program and assist with inventory/surveying and monitoring water bodies for aquatic plant species such as Eurasian watermilfoil and flowering rush.
   - Continue FWP inventory, mapping, and monitoring of weed infestations and weed management activities on fishing access sites and state parks, and wildlife management areas.

- Continued monitoring to ensure that adequate funding is available to manage rights-of-ways in accordance to the MDT vegetation management plan.

2) **Increase and improve search efforts for invasive species with an emphasis on newly establishing invasive species to contain their populations to a smaller area.**
   Responsibility: FS
   - Increase invasive weed inventory and mapping on the national forests, to enhance early detection and support identification of priority species and sites for treatment.

3) **Improve monitoring for invasive species populations and control efforts to ensure that management is measured, analyzed, and evaluated for effectiveness.**
   Responsibility: MDA, MBCWG, and FS
   - Enhance monitoring, weed inventory and data as sources become available to house information.
   - Establish a biocontrol mapping program to gather release, distribution, and monitoring data.

4) **Expand the use of EDDMapS West database system by land managers for noxious weed inventories on all lands in Montana.**
   Responsibility: MDA and CWDs
   - Enhance weed inventory and data input through EDDMapS.
   - Conduct weed inventories using EDDMapS and integrate inventory and monitoring efforts into annual operations.

Rapid Response

1) **Develop a generalized rapid response plan for emerging invasive species.**
   Responsibility: Private Conservation
   - Encourage Montana Land Trust organizations to adopt policies that promote early detection and management of noxious weeds on lands encompassed by conservation easements.

2) **Improve the capacity to respond to new invasions of high priority invasive species to contain their spread, limiting the damage they cause.**
   Responsibility: APHIS/PPQ
   - Strengthen PPQ's pest exclusion system.
   - Optimize PPQ's domestic pest management and eradication programs.

3) **Prepare natural resources managers to effectively use all tools available to improve the outcomes of rapid response actions.**
   Responsibility: FWS
   - Maintain Strike Team program for Early Detection and Rapid Response and partnerships.

4) **Develop strategies for noxious weed related emergencies that occur from natural disasters.**

Control

1) **Grow both capacity and expertise in managing invasive species in Montana to improve program effectiveness.**
   Responsibility: FWP, MBCWG, FS, and FWS
   - Continue to evaluate and prioritize current FWP noxious weed management practices and focus future efforts on high priority sites.
   - Coordinate biocontrol agent distribution efforts.
   - Provide funding support to high priority biological control research needs, with an emphasis on agents for rush skeletonweed.
   - Increase budgets for Montana NWRs and WMDs by $1.7 to $2.4 million (treat 25-35% of infested acres).

2) **Expand collaborative working relationships with enforcement agencies to increase compliance with existing regulations for invasive species.**

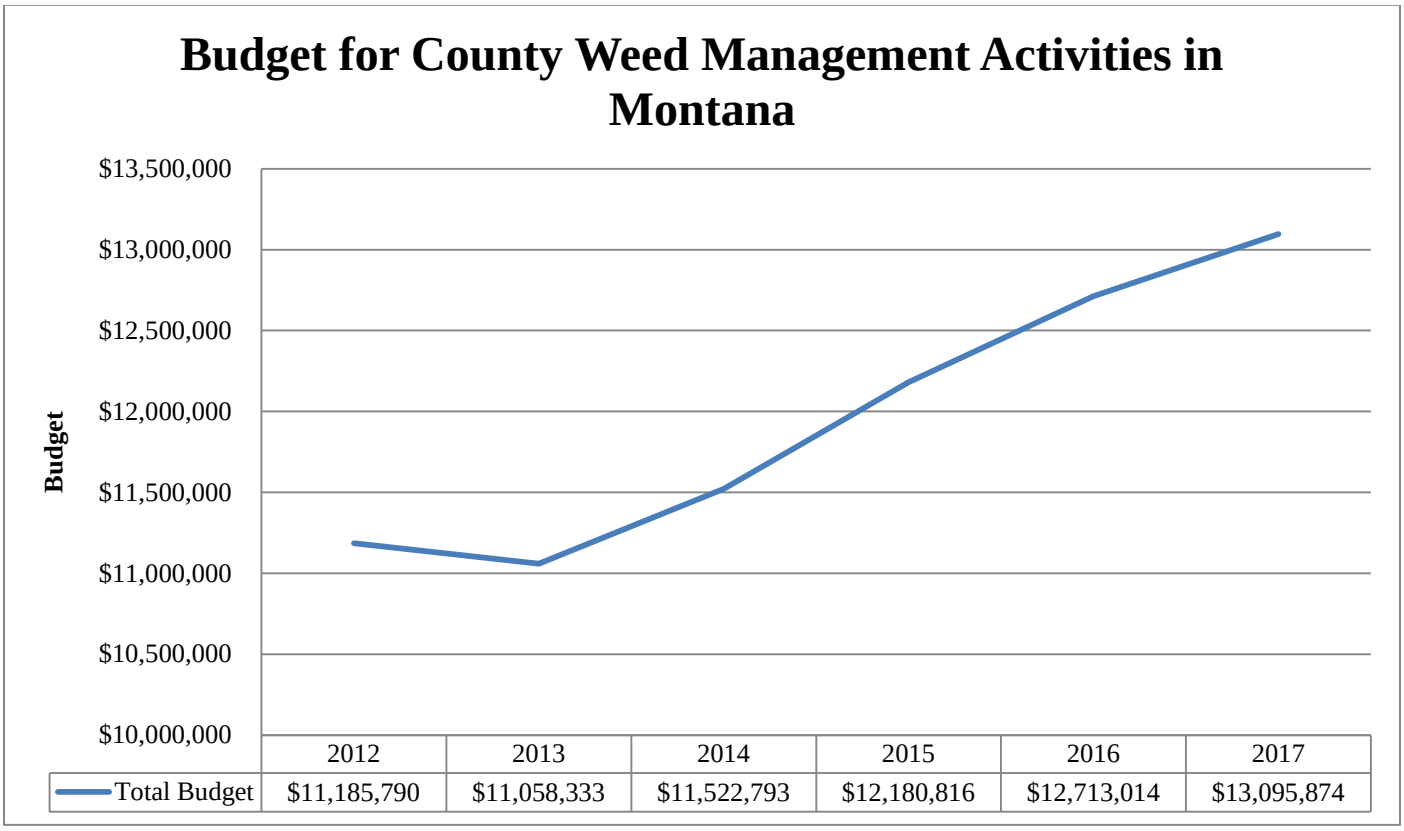
3) **Ensure that invasive species control restores the desired ecological, economic, and cultural values to the land that is being managed.**

4) **Strengthen and expand CWMAs that include private municipal, university, county, state, tribal, and federal land interests.**
   Responsibility: BLM
   - Increase budgets to $3 million through appropriation increases and leveraging cost-share funding to adequately contain and suppress current levels of infestations, and conduct rehabilitation projects.

5) **Prioritize and implement ecologically based IWM programs.**
   Responsibility: FWP, FS, BIA, and Universities
   - Continue wise-use of integrated noxious weed management methods to protect and enhance native plant communities, fish and wildlife and other natural resources.
   - Incorporate invasive species management objectives, standards and guidelines into revised national forest management plans.
   - Increase use of IWM by implementing improved pasture management, increasing use of biological control, and promoting/implementing the use of sheep and goats as a weed management tool.
   - Implement IWM programs on university owned lands.

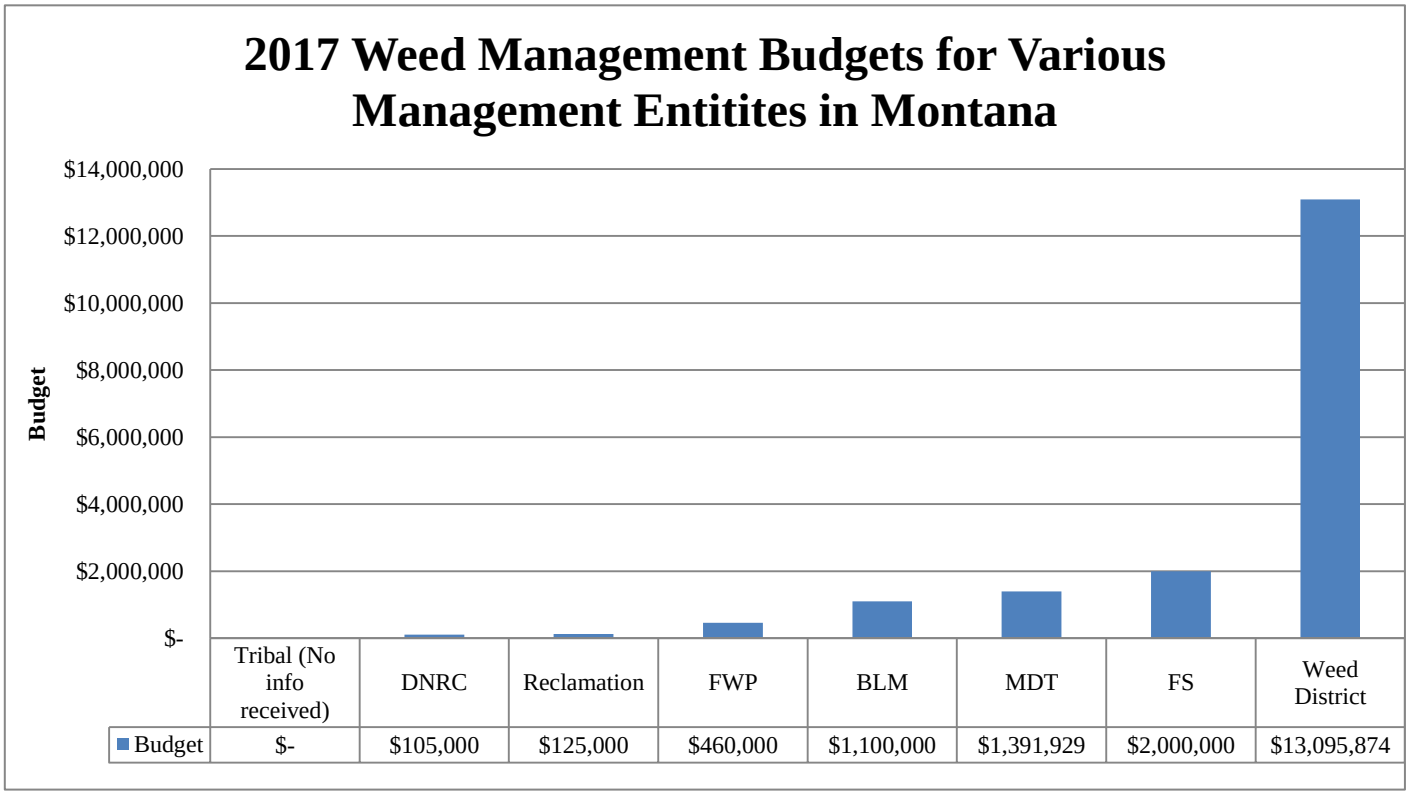
Appendix B: Estimated Budget Information

Agencies, county weed districts, private land managers, and private corporations provided information included in this section. Treatment costs vary depending on treatment method, weed species treated, and location of infestations. Increased funding is critical to address the level of weed infestations in the state. Revenue generated at the county level for weed management in Montana increased approximately $1.9 million from 2012 to 2017. However, the present budget remains inadequate to stop the introduction of new species and slow the spread of existing weed infestations. A balanced comprehensive weed management program that segments funding toward public education and awareness, prevention, early detection, IWM, and rehabilitation is vital to successfully manage large-scale weed infestations. In addition, a coordinated research effort is necessary to develop more sustainable, cost-effective weed management techniques.



	2012	2013	2014	2015	2016	2017
Total Budget	$11,185,790	$11,058,333	$11,522,793	$12,180,816	$12,713,014	$13,095,874

County weed district budgets based on NWTF Special County/Reservation grant applications



Information was provided by each agency and county weed district. No information was received from any tribal entity. DNRC does not include DNRC Forestry Program. Additional budget information can be obtained from the Department of Agriculture.

Appendix C: Montana Noxious Weed Infested Acres

Acres in Montana Infested with Noxious Weeds 2016	
Spotted Knapweed	2,227,010
Canada Thistle	1,411,060
Leafy Spurge	781,916
St. Johnswort	698,355
Houndstongue	541,581
Field Bindweed	529,206
Orange Hawkweed	513,041
Tansy Ragwort	300,691
Whitetop or hoary cress	279,208
Dalmatian Toadflax	187,764
Ox-eye Daisy	173,277
Sulfur (Erect) Cinquefoil	152,262
Hoary Alyssum	121,531
Yellow Toadflax	68,681
Russian Knapweed	66,540
Common Tansy	65,880
Saltcedar	62,168
Tall Buttercup	34,321
Curlyleaf Pondweed	13,813
Meadow Hawkweed Complex	11,661
Diffuse Knapweed	10,402
Blueweed	8,864
Perennial Pepperweed	3,812
Eurasian Watermilfoil	3,397
Rush Skeletonweed	3,287
Yellowflag Iris	2,864
Knotweed Complex	750
Flowering Rush	750
Purple Loosestrife	384
Scotch Broom	152
Dyer's Woad	11
Common Reed	9
Yellow Starthistle	<1
TOTAL ACRES INFESTED WITH NOXIOUS WEEDS IN 2016	**8,274,648**

Information received from county weed districts.

Appendix D: The Statewide Noxious Weed List

Effective: February 2017

PRIORITY 1A These weeds are not present or have a very limited presence in Montana. Management criteria will require eradication if detected, education, and prevention:

(a) Yellow starthistle (*Centaurea solstitialis*)
(b) Dyer's woad *(Isatis tinctoria*)
(c) Common reed *(Phragmites australis ssp. australis)*
(d) Medusahead *(Taeniatherum caput-medusae)*

PRIORITY 1B These weeds have limited presence in Montana.
Management criteria will require eradication or containment and education:

(a) Knotweed complex (*Polygonum cuspidatum, P. sachalinense, P. × bohemicum, Fallopia japonica, F. sachalinensis, F. × bohemica, Reynoutria japonica, R. sachalinensis, and R.× bohemica*)
(b) Purple loosestrife (*Lythrum salicaria*)
(c) Rush skeletonweed (*Chondrilla juncea*)
(d) Scotch broom (*Cytisus scoparius*)
(e) Blueweed (*Echium vulgare*)

PRIORITY 2A These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Tansy ragwort (*Senecio jacobaea, Jacobaea vulgaris*)
(b) Meadow hawkweed complex (*Hieracium caespitosum, H. praealturm, H. floridundum, and Pilosella caespitosa*)
(c) Orange hawkweed (*Hieracium aurantiacum, Pilosella aurantiaca*)
(d) Tall buttercup (*Ranunculus acris*)
(e) Perennial pepperweed (*Lepidium latifolium*)
(f) Yellowflag iris (*Iris pseudacorus*)
(g) Eurasian watermilfoil (*Myriophyllum spicatum, Myriophyllum spicatum x Myriophyllum sibiricum***)**
(h) Flowering rush (*Butomus umbellatus*)
(i) Common buckthorn *(Rhamnus cathartica L.)*

PRIORITY 2B These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Canada thistle (*Cirsium arvense*)
(b) Field bindweed (*Convolvulus arvensis*)
(c) Leafy spurge (*Euphorbia esula*)
(d) Whitetop (*Cardaria draba, Lepidium draba*)
(e) Russian knapweed (*Acroptilon repens, Rhaponticum repens*)
(f) Spotted knapweed (*Centaurea stoebe, C.maculosa*)
(g) Diffuse knapweed (*Centaurea diffusa*)
(h) Dalmatian toadflax (*Linaria dalmatica*)
(i) St. Johnswort (*Hypericum perforatum*)

(j) Sulfur cinquefoil (*Potentilla recta*)
(k) Common tansy (*Tanacetum vulgare*)
(l) Oxeye daisy (*Leucanthemum vulgare*)
(m) Houndstongue (*Cynoglossum officinale*)
(n) Yellow toadflax (*Linaria vulgaris*)
(o) Saltcedar (*Tamarix spp*.)
(p) Curlyleaf pondweed (*Potamogeton crispus*)
(q) Hoary alyssum (*Berteroa incana*)

PRIORITY 3 Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)
Theseregulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant.

(a) Cheatgrass (*Bromus tectorum*)
(b) Hydrilla (*Hydrilla verticillata*)
(c) Russian olive (*Elaeagnus angustifolia*)
(d) Brazilian waterweed (*Egeria densa*)
(e) Parrot feather watermilfoil (*Myriophyllum aquaticum or M. brasiliense*)

Appendix E: Legislation Associated with Noxious Weed Programs in Montana

County Weed Control Legislation

Local county government has the responsibility for implementation and enforcement of weed management in Montana.

- **Montana County Weed Control Act (Title 7, Chapter 22 Part 21)** is implemented and enforced at the local county level. Each county government is required to appoint a county weed control board. The law requires counties to develop a long-term management plan for the control of noxious weeds in their county.

State Weed Legislation

- **Montana County Weed Control Act (Title 7, Chapter 22 Part 21)** requires each agency to submit a biennial performance report to MDA on state-owned or state-controlled lands. These provisions were enacted by the 1995 Montana Legislature and MDA is currently working with agencies and counties to facilitate implementation.
- **The Montana Weed Control Act (Title 80, Chapter 7 Part 7)** provides for technical assistance, funding of noxious plant management programs, and embargoes. Section 80-7-712 MCA allows MDA to obtain federal funds and disburse funds to local governments authorized to conduct noxious plant management programs. In addition, Section 80-7-720 MCA authorizes the Department of Agriculture to expend funds for the collection and distribution of biological agents to control leafy spurge and spotted knapweed and the Montana DNRC to administratively transfer funds to the Department of Agriculture for biocontrol projects.
- **The Montana Noxious Weed Seed Free Forage Act (Title 80, Chapter 7, Part 9)** establishes a state noxious weed seed free forage and mulch certification program used by individuals, agencies, and private corporations on public and private lands.
- **The Montana Agricultural Seed Act (Title 80, Chapter 5, Part 1)** lists prohibited and restricted seed levels that must be maintained in state certified seed. All state noxious weeds are included in this list.
- **The Montana Commercial Feed Act (Title 80, Chapter 9, Part 1)** prohibits noxious weeds in commercial feed.
- **The Montana Nursery Law (Title 80, Chapter 7, Part 1)** allows for inspection, certification, and embargo of all nursery stock for listed pests, including weeds.
- **The Montana Environmental Policy Act (Title 75, Chapter 1, Part 1-3)** must be addressed by all MDA actions that have potential environmental or socioeconomic impacts.
- **The Montana Noxious Weed Trust Fund Act (Title 80, Chapter 7, Part 8)** Provides for a grant-funding program designed to encourage local cooperative weed management programs,

creative research in weed control, including the development of biological control methods, and educational programs.

Federal Weed Legislation

- **The Plant Protection Act (Public Law 106-224-June 20, 2000)** provides for the detection, control, eradication, suppression, and prevention of the spread of plant pests and noxious weeds.

- **Federal Noxious Weed Act (Public Law 93-629-November 28, 1990)** provides for the management of undesirable plants on federal lands.

- **Federal Seed Act (7 U.S.C. 1551-1611 – Issued March 1940 and revised April 1998)** provides for the regulation of interstate and foreign commerce in seeds, requires labeling and to prevent misrepresentation of seeds in interstate commerce, and requires specific standards with respect to certain imported seeds.

- **The Noxious Weed Control and Eradication Act (Public Law 108-412-October 30, 2004)** provides assistance to eligible weed management entities to control or eradicate noxious weeds on public and private land.

Appendix F: Cooperative Weed Management Areas

A Cooperative Weed Management Area is an excellent tool for coordinating action and sharing expertise and resources to combat common weed species in a defined geographical area. Local organizations bring together landowners and land managers (private, city, county, state, and federal) to effectively manage weeds as a unified group. Locally-driven CWMAs are especially effective at generating public interest in weed management and organizing community groups to support on-the-ground programs.

Developing a CWMA in Montana

In Montana, every county has a weed district with a county weed management plan. In cooperation with the county weed coordinator, CWMAs may be established by landowners or land managers to encompass part of a county, or a natural land area (such as a watershed) that includes adjoining parts of several counties. CWMAs do not supplant CWDs; but can facilitate cooperation across private, county, state, and federal boundaries.

CWMAs often function under the authority of a mutually developed Memorandum of Understanding or Cooperative Agreement and are governed by a steering committee. In designating a CWMA, the first steps are:

- **Invite all landowners/managers:** Call an organizational meeting to bring together all the potential partners, listen to each other's ideas and concerns about a CWMA, and begin to develop a group vision and plan.
- **Develop boundaries**: Establish clearly-defined boundaries, generally coordinated with counties and possibly adjoining CWMAs. Boundaries of a CWMA may be created according to watersheds, topography, weed species, land usage, and/or rights-of-ways.
- **Identify special management zones** within the CWMA such as: aquatic areas, habitats of threatened and endangered species or species of special concern, recreational/special use areas, transportation corridors, and relatively weed-free areas. For instance, weed-free areas should be identified, prioritized for prevention, and given special designation and protection.

Creating a CWMA Management Plan

Together, CWMA partners develop a comprehensive weed management plan for their area. Detailed information regarding development of Weed Management Areas is described in "Guidelines for Coordinated Management of Noxious Weeds: Development of Weed Management Areas."[1] CWMA plans include weed surveying and mapping components as well as strategies for IWM and prevention. More comprehensive plans may include public education and training, early detection of new invaders, monitoring, and annual evaluation and adaptation of the weed management plan.

[1]Available [Online] http://weedcenter.org/management guidelines/tableofcontents.html

An initial assessment of the situation (landowner involvement, weed abundance and distribution, impacts of weeds, current management, level of community support, etc.) will determine the weed management objectives. For example, rather than treat weeds immediately, it may be most effective to establish awareness and prevention programs first.

Elements of a typical weed management plan include:

- A complete description of the proposed area, including natural features, soil types, transportation corridors, population centers, maps, and descriptions of weed infestations.
- Goals and objectives, including long-term priorities and planning (five to 10 years), which may address prevention strategies; weed reduction, containment, or eradication; and educational programs.
- Budgets, including funding sources (federal, state county, local landowner, grants) and shared equipment, supplies, and staffing. Determine short- and long-range needs: equipment purchases, herbicides, rearing cages for biocontrol agents, public outreach materials, etc. Develop a yearly procurement plan to include personnel, operations, equipment, and supplies.
- Cooperators' roles and responsibilities, including a list of agencies and jurisdictions involved, and a timeline.
- A list of target weeds and potential control methods with pros and cons of each. Note recommended control for a specific area, the timing of control, and recommended rates.
- Special management zones, including areas with stringent management criteria, relatively weed-free areas that would benefit from site-specific prevention strategies, and disturbed areas (for example, burned or flooded sites) that may require immediate attention.
- Strategies for gathering public comment on the management plan. This can help increase public awareness and build public support.
- Evaluations, which should be conducted annually and should include a weed inventory to determine whether the long-term goals of reducing weed populations or preventing infestations are being met. Management plans will change over time to insure their effectiveness as new situations arise.

ADVANTAGES OF A CWMA

CWMAs encourage long-term planning to a successful resolution. Planning establishes priorities – cooperators can emphasize a particular species or area. CWMAs focus attention and provide a united front to state and federal legislators, as well as communicate to the general public the seriousness of good land management and the value of healthy ecosystems. CWMAs pool talents and resources; address the problem of weeds spreading from neighboring land before the damage occurs; provide channels for communication between cooperators; and adequately assess the risk of damage to water, crops, threatened and endangered species, etc. CWMAs base control efforts on biological and geographical factors rather than legal divisions, thus increasing the effectiveness of weed management. And finally, CWMAs may help secure more stable funding for long-term management and prevention efforts.

Appendix G: Abbreviations

AGMB – Agriculture and Grazing Management Bureau	**MNWEC –** Montana Noxious Weed Education Campaign
ANS - Aquatic Nuisance Species	**MRL –** Montana Rail Link
AO – Area Offices	**MSU –** Montana State University
APHIS – USDA Animal and Plant Health Inspection Service	**MWCA –** Montana Weed Control Association
ARS – USDA Agricultural Research Service	**NFWF –** National Fish and Wildlife Foundation
BIA – USDA Bureau of Indian Affairs	**NPS –** USDI National Park Service
BLM - USDI Bureau of Land Management	**NRCS –** USDA Natural Resource Conservation Service
BNSF – Burlington Northern Santa Fe Railroad	**NWR –** National Wildlife Refuges
CA – Cooperative Agreements	**NWRS –** National Wildlife Refuge System
CBP – Customs and Border Protection	**NWTF –** Noxious Weed Trust Fund
CWD – County Weed District	**PAW –** Partners Against Weeds
CWMA – Cooperative Weed Management Area	**PPQ –** Plant Protection and Quarantine
DNRC – Department of Natural Resources and Conservation	**REMB –** Real Estate Management Bureau
EDDMapS – Early Detection and Distribution Mapping System	**RMEF –** Rocky Mountain Elk Foundation
EIS – Environmental Impact Statement	**RMRS –** Rocky Mountain Research Station
FMB – Forest Management Bureau	**S&PF –** State and Private Forestry
FSA – USDA Farm Service Agency	**SSTL –** State School Trust Lands
FWP – Department of Fish, Wildlife & Parks	**SWCD –** Soil and Water Conservation District
FWS – USDI Fish and Wildlife Service	**TLMD –** Trust Land Management Division
IWM – Integrated Weed Management	**TNC –** The Nature Conservancy
MACD – Montana Association of Conservation Districts	**UM –** University of Montana
MAES – Montana Agricultural Experiment Station	**UO –** Unit Offices
MBCWG – Montana Biological Control Working Group	**UP –** Union Pacific
MCA – Montana Code Annotated	**USDA –** United States Department of Agriculture
MDA – Montana Department of Agriculture	**USDI –** United States Department of Interior
MDT – Montana Department of Transportation	**FS –** United States Forest Service
MISAC – Montana Invasive Species Advisory Council	**WMD –** Wetland Management Districts
MMB – Minerals Management Bureau	**YNP –** Yellowstone National Park

Appendix H – References

Brown, M.L. 2005. Loosestrife Family: Lythraceae. Purple Loosestrife, *Lythrum salicaria* (L.) P. Mill. Duncan, C.A. and J.K. Clark, eds. Invasive Plants of Range and Wildlands and their Environmental, Economic, and Societal Impacts. Lawrence, KS: Weed Science Society of America.

Dewey, S.A. 1995. A biological wildfire: Applying fundamentals of wildfire management to improve noxious weed control. Utah State Univ., Logan UT. AG500.

Fuller, K., Davis, S., Mangold, J., and Rinella, M. 2016. Economic impact of noxious weeds on private grazing lands. Montana State University. Monthly Weed Post October 2016. *Awaiting peer review.*

Goodwin, K., 2015. Montana Weed Prevention Areas Program. Center for Invasive Species Management. Montana State University. Page 3.

Hirsch, S.A., and J.A. Leitch. 1996. The impact of knapweed on Montana's economy. Fargo, ND: North Dakota State University Ag. Econ. Rep. No. 355. Page 41.

Kurz, G.L. 1995. Ecological implications of Russian knapweed (*Centaurea repens* L.) infestation: Small mammal and habitat associations. M.S. thesis. University of Wyoming, Laramie, WY. Page 59.

Lacey, J.R., C.B. Marlow, and J.R. Lane. 1989. Influence of spotted knapweed (*Centaurea maculosa*) on surface runoff and sediment yield. Weed Technol. 3(4):627-631.

Leitch, J.A., F.L. Leistritz, and D.A. Bangsund. 1994. Economic effect of leafy spurge in the upper Great Plains: methods, models, and results. Fargo, ND: North Dakota State University Agric. Econ. Rep. No. 316. Page 8.

Lesica, P., and J.S. Shelly. 1996. Competitive Effect of *Cenaurea maculosa* on the population dynamics of *Arabis fecunda*. Bull. Torrey Bot. Club 123:111-121.

McClure, C. Personal Communication, Yellowstone National Park, Invasive Plant Coordinator.

McDaniel K.C., J.M. DiTomaso, and C.A. Duncan. 2005. Tamarisk Family: Tamaricaeae. Tamarisk or Saltcedar, *Tamarix* spp. Duncan, C.A., and J.K. Clark, eds. Invasive Plants of Range and Wildlands and their Environmental, Economic, and Societal Impacts. Lawrence, KS: Weed Science Society of America.

Montana Biological Control Working Group. 2015. The Montana Action Plan for the Biological Control of Invasive Plants. Littlefield, J., K. Keever, and J. Birdsall (eds.) Page 42.

Scheiman, D.M., E.K. Bollinger, and D.H. Johnson. 2003. Effects of leafy spurge infestation on grassland birds. J. Wildlife Manage. 67:115-121.

Thompson, M.J. 1996. Winter foraging response of elk to spotted knapweed removal. Northwest Sci. 70(1):10-19.

Trammell, M.A. and J.L. Butler. 1995. Effects of exotic plants on native ungulate use of habitat. J. Wildlife Manage. 59:808-816

USDA Forest Service. 2013. Forest Service National Strategic Framework for Invasive Species Management. USFS-1017. Washington, DC. Page 36.

USDA Natural Resource Conservation Service. 2012. National Res. Inventory Summary Report 2012. [Online] https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Montana/cp99030.pdf Accessed: May 2017

Images:

Ostwald, B. Carbon County Weed Coordinator. 2016. Photos: cover page, v, 1, 5, 31, and 46.

Reimer, J. Montana Department of Agriculture. 2016. Photo: Page 14.